

**Interest on Reserves:
A Preliminary Analysis of Basic Options¹**

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¹ This document summarizes work conducted by the Interest on Reserves workgroup. Members of the workgroup include Jim Clouse (Co-Chair), Seth Carpenter, John Driscoll, Sherry Edwards, David Mills and Travis Nesmith from the Board; Spence Hilton (Co-Chair), Leo Bartolini, Chris Burke, Todd Keister, Antoine Martin and Jamie McAndrews (FRB NY); Ron Feldman (FRB Minneapolis); Steve Meyer (FRB Philadelphia); Huberto Ennis and John Weinberg (FRB Richmond). This draft has benefited from the comments of Bill Dudley, Joe Gagnon, Don Hammond, Brian Madigan, and Jeff Marquardt.

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I. Executive Summary

New legal authority to lower reserve requirements to as low as zero and to pay explicit interest on balances that depository institutions hold at Reserve Banks will become effective in October 2011. That new authority will give the Federal Reserve an opportunity to reduce or eliminate the burdens and distortions associated with current reserve requirements. Moreover, the new authority may allow changes in the Federal Reserve's approach to implementing monetary policy that could reduce intraday and day-to-day volatility in the funds rate and simplify reserve management for depository institutions as well as the Federal Reserve.

At the Chairman's direction, the Director of the Board's Division of Monetary Affairs established a workgroup to conduct a preliminary study of potentially useful ways to use the new legal authority. The group was asked to develop options to achieve four key objectives:

1. Reducing burdens and deadweight losses associated with the current system of reserve requirements.
2. Preserving or enhancing the Desk's ability to hit the FOMC's target for the federal funds rate.
3. Promoting efficient and resilient money markets and government securities markets.
4. Promoting an efficient and resilient payment system.

This paper presents the results of that study. It contains a preliminary analysis of five options for implementing the new authority. The options illustrate a range of feasible approaches to monetary policy implementation but certainly do not exhaust all possibilities. All options include paying interest on balances. Some involve modest changes in reserve requirements or in the methods the Desk uses to hit the target for the federal funds rate; others encompass sweeping changes. The options make different tradeoffs among the four key objectives, and none is clearly superior on all counts. Several options might cause significant changes in the federal funds market. Most of the options are consistent with the proposed changes to the Payment System Risk (PSR) policy that have recently been published by the Board for public comment.² However, some of the options could involve sharp reductions in the usage of daylight credit. Several of the options, perhaps all, could have implications for cost recovery in the System's provision of priced services.³

² Proposed revisions to PSR Policy include reducing the fee on collateralized daylight overdrafts to zero while raising the fee on uncollateralized daylight overdrafts to the equivalent of 50 basis points per year. For banks that pledge collateral, the proposed revision would reduce the cost of using daylight credit to make payments relative to the cost of holding balances to make payments; that change would tend to reduce demand for balances. Remunerating balances would work in the opposite direction.

³ Another workgroup is analyzing the implications of these options for the Federal Reserve's priced services. That group also will explore alternative pricing models.

The Federal Reserve has long recognized the burdens associated with reserve requirements. Requiring depository institutions to hold a fraction of checkable deposits as non-interest-bearing balances at the Reserve Banks imposes a “reserves tax” equal to the opportunity cost of holding required reserve balances. Depository institutions set up and operate sweep programs to minimize this tax by reducing the amount of reservable deposits they report to the Federal Reserve. Even so, staff estimates that the reserve tax totaled \$380 million in 2006. In addition, the complex structure of current reserve requirements imposes administrative burdens that go beyond the reserve tax. Depository institutions must devote resources to completing and submitting deposit reports, and to complying with the complex rules that define reservable deposits. The Federal Reserve, too, incurs sizable costs in administering reserve requirements and monitoring compliance.

In principle, reserve requirements contribute to a stable and predictable demand for balances and thus help a central bank hit a target for the overnight interbank interest rate by managing the supply of balances through open market operations. In practice, the U.S. system of reserve requirements does not always achieve this goal. Though the average federal funds rate over a fourteen-day reserve maintenance period rarely deviates from target by more than a few basis points, the daily average rate was more than 25 basis points away from target on nearly 2 percent of trading days over the period from 2000 to 2006. In addition, the federal funds rate often deviates quite substantially from target late in the day. These transitory deviations from target reflect, in part, variations in depository institutions’ total demand for balances: Demand is higher on days during which a high volume of payments flows through the U.S. banking system than on other days; that day-to-day variation in demand for balances is not entirely predictable. There is no evidence, however, that transitory deviations of the funds rate from target have macroeconomic effects.

There are two ways to reduce burdens and deadweight losses associated with reserve requirements. The Federal Reserve could eliminate the reserves tax by paying interest on required reserve balances at a rate equal to or slightly below the target for the federal funds rate, thus making the opportunity cost of holding required balances essentially zero. Alternatively, the Federal Reserve could reduce reserve requirements to zero and thus eliminate both the reserve tax and other burdens. Both approaches are included among the five options discussed in this paper.

To reliably hit a federal funds rate target on a daily basis using open market operations, the Desk ideally would operate in an environment that provides a highly interest-elastic and at least somewhat predictable demand for balances: When demand is highly elastic, an inadvertent shortfall or surplus of balances causes only a small deviation of the actual funds rate from its target. If, instead, the demand for balances were quite inelastic, in principle the Federal Reserve could rely more heavily on standing facilities and more frequent open market operations to keep the federal funds rate within a tolerable range around its target. Four of the five options discussed below should, in theory, generate a highly elastic and at least somewhat predictable demand for balances: Two options produce an elastic demand by allowing depository institutions to hold required or target

levels of balances on average over a maintenance period; another two create an elastic demand by allowing a wide daily clearing band. One option would likely result in an inelastic demand and would rely heavily on standing facilities to stabilize the funds rate.

Options 1 through 4 are similar to approaches used by central banks in various economies with well-developed financial sectors. Foreign central banks' experience indicates that it is possible to hit an interest rate target using any of these approaches; their experience also indicates that some of the options would require changes in the Desk's approach to hitting the interest rate target. Of course, foreign experience may not be directly applicable to the United States and its unique banking sector. Option 5 is potentially appealing but untested—although many of its core elements are employed in other countries. The key structural elements of these five options are listed below in Table 1.

Summary of Five Options

Option 1: Remunerate Required and Excess Reserve Balances

This option takes one step away from the current environment. It would eliminate the reserves tax but would not reduce other burdens associated with reserve requirements. It would set a nonzero floor under the federal funds rate but probably would not otherwise alter funds rate volatility. It would require no alteration in the Desk's operating procedures and would not cause substantial changes in the federal funds market.

Under option 1, the Federal Reserve would retain reserve requirements to help generate a predictable demand for balances. The Federal Reserve would pay interest on required reserve balances at a rate equal to or slightly below the target federal funds rate, making the opportunity cost of holding required balances zero and eliminating the reserve tax. Excess reserves would be remunerated at a lower rate; this option assumes in particular that the spread between the target federal funds rate and the rate paid on excess reserves would equal the spread between the primary credit rate and the target funds rate. Policymakers could set fairly wide spreads during normal times and narrow them during periods of financial turmoil if they thought it appropriate to control the funds rate more tightly during such episodes. Other elements of the current framework (including the structure and administration of reserve requirements, the contractual clearing balance program, differences in maintenance periods and required reserve ratios for small versus large banks, carryover provisions, and deposit reports) would be left intact; thus, the burdens associated with these elements of the current system of reserve requirements would not be reduced. In many key respects, option 1 resembles the approach currently used by the European Central Bank.⁴

⁴ The ECB, however, imposes a uniform 2 percent reserve requirement on virtually all of "credit-granting" institutions' deposit and non-deposit liabilities that have initial maturities of two years or less. U.S. law authorizes the Federal Reserve to impose reserve requirements only on depository institutions' transactions deposits, nonpersonal time deposits, and net liabilities to foreign affiliates and other foreign banks.

If option 1 were implemented, the total demand for balances likely would be somewhat larger than today, because remunerating required reserve balances at a rate equal to or slightly below the target federal funds rate would remove much of the incentive to engage in reserve tax avoidance schemes such as retail sweep programs. Moreover, remunerating required reserve balances could lead some institutions to meet their reserve requirements by holding larger required reserve balances and less unremunerated vault cash. From another perspective, remunerating required and excess balances would, at the margin, lower the cost of holding balances relative to the cost of incurring an overnight overdraft (assuming no change in the penalty fee for overnight overdrafts); that change in relative price could lead some banks to target larger end-of-day balances. Remunerating excess reserve balances might make the demand for balances somewhat less variable from day to day than currently is the case because it would eliminate or reduce banks' incentive to delay holding balances to meet requirements until late in the maintenance period. The Desk would conduct open market operations on a day-to-day basis much as it does today. Finally, remunerating excess reserves at a positive rate lower than the target federal funds rate would establish a nonzero lower bound on the level of the federal funds rate—a lower bound that is missing today—without eliminating the incentive for banks that have larger balances than needed to sell fed funds.⁵

A potentially appealing variant of option 1 would simplify the administration of reserve requirements by adopting uniform two-week maintenance periods for all depository institutions, eliminating carryover provisions, streamlining deposit reports and data collection, and basing reserve requirements on a simpler and more transparent definition of transaction deposits. Simplification could reduce the costs and burdens associated with reserve requirements, for the Federal Reserve as well as depository institutions. But some burden would remain, including the complexities associated with annual adjustments in the low reserve tranche and exemption amounts, which are required by statute, and the need to monitor compliance with requirements.

Option 2: Voluntary Balance Targets

This option takes a larger step away from the System's current approach; it would eliminate the reserves tax by replacing reserve requirements with a voluntary target balance program that would have less administrative overhead for the Federal Reserve and would reduce administrative burdens borne by depository institutions. By lengthening the maintenance period to the interval between FOMC meetings, option 2 offers somewhat greater scope than option 1 for reducing variability in the federal funds rate, but volatility could increase if the sum of voluntary balance targets turns out to be appreciably smaller than the current level of required reserve balances. Option 2 would

⁵ From the perspective of a bank that has excess balances and thus might wish to sell federal funds, a balance at the Federal Reserve is a risk-free asset while federal funds sold involve some counterparty credit risk. The spread between the interest rate for unsecured overnight loans (the federal funds rate) and the rate for secured overnight loans (the general-collateral repo rate) typically is between 10 and 15 basis points, suggesting that the remuneration rate on excess balances would have to be at least 15 basis points lower than the target federal funds rate to induce banks to lend excess balances in the federal funds market at the target funds rate.

not require changes in the Desk's approach to implementing monetary policy; it is unlikely to generate large changes in the federal funds market.

Under option 2, depository institutions could choose targets for their average balances over a relatively long maintenance period that might be set equal to the period between FOMC meetings. Each institution's average balance over the maintenance period would earn explicit interest at the target federal funds rate up to the upper end of a narrow clearing band—perhaps plus or minus 1 percent—around its target. Any amount by which an institution's average balance exceeded the upper end of its target band would be remunerated at a lower rate. The spread between the target federal funds rate and the rate paid on above-band balances would equal the spread between the primary credit rate and the target funds rate. If an institution's average balance fell short of the bottom of its target band, the deficiency would be penalized at a rate that would make the cost of falling short equal to or greater than the cost of borrowing at the primary credit rate. A surplus or shortfall in meeting the voluntary balance target could not be carried into the next maintenance period. An institution that chose not to establish a target balance would earn interest on its balance at the rate paid on above-band balances. This combination of features would give depository institutions an incentive to choose balance targets and then to manage their accounts to hit their targets. The Federal Reserve would have no need to collect detailed daily data about various types of deposits to compute required reserves or to monitor compliance with reserve requirements; it would be necessary only to track institutions' actual balances and their targets. Eliminating deposit reports would reduce the administrative burden on depository institutions, but they would still incur the costs of managing their balances to hit their targets (though they could avoid those costs by not choosing a target and instead accepting a lower remuneration rate on their balances). Sample reports would still be needed to collect data for compiling the monetary aggregates. In key respects, option 2 is close to the approach currently employed by the Bank of England.

Like required reserve balances, voluntary balance targets would provide a lower bound on the period-average demand for balances. Large banks likely would choose a target balance close to their estimates of their average need for balances to make payments without incurring overnight overdrafts. Small banks might hold modest balances without choosing targets; such balances would be equivalent to the excess reserves that small banks hold today but would be remunerated. The current contractual clearing balance program—a program in which banks earn implicit interest on balances at the Federal Reserve in the form of earnings credits that can be applied to offset charges for priced services—would be eliminated. The total demand for balances in this option is difficult to predict in advance. The total demand for balances might be larger than today because option 2 would reduce the opportunity cost of holding balances to zero, for institutions that hit their targets. On the other hand, the demand for balances could be smaller than today if institutions that currently have to hold balances to meet reserve requirements were to reduce their balances. Large banks' daily demands for balances probably would continue to rise and fall with the volume of payments flowing through their reserve accounts, but banks would have a much smaller incentive than today to minimize their balances on days without high payment flows. Accordingly, the demand for balances

likely would be less variable from day to day than now. Moreover, the demand for balances could be more elastic than today (until the end of the maintenance period) because a longer maintenance period would allow more days for banks to average out day-to-day deviations from their target balances.⁶ The opportunity cost of holding average balances that differ from target by more than 1 percent would give institutions an incentive to undertake federal funds transactions to manage their balances, so the federal funds market would serve the same function as today.

The Desk could conduct open market operations much as it does today. If the Desk kept the average level of balances close to the aggregate need as the maintenance period progressed, the plus or minus 1 percent band would make the demand for balances elastic over a fairly wide range through the end of the maintenance period, helping to keep the funds rate close to its target even if there were a large inadvertent gap between the supply of balances and the notional target demand on the last day of the period. But the demand for balances would become highly inelastic, at the end of maintenance period, for quantities outside of the plus or minus 1 percent band. Thus, a shortfall (or surplus) in the supply of balances that is large enough to leave the banking system outside of that band at the end of the period likely would push the federal funds rate up to the primary credit rate (or down to the remuneration rate on excess balances).⁷

Option 3: Simple Corridor

Under option 3, reserve requirements, and thus the reserves tax and all other burdens and costs associated with reserve requirements, would be eliminated. Any balances that institutions hold overnight would earn interest; this remuneration rate would lie below the target federal funds rate by the same amount that the primary credit rate exceeds the target funds rate. Overnight overdrafts would be penalized. Option 3 is similar to the approaches used by the central banks of Australia and Canada.

Banks' demand for balances each day likely would be close to the minimum levels needed to support that day's payment flows without taking on a large risk of incurring an overnight overdraft. Thus the demand for balances likely would be both relatively inelastic and variable (large on high-payment-flow days but small on other days). The Desk would face the challenge of supplying exactly the quantity demanded each day. Banks would use the federal funds market to manage their balances on a daily basis largely to avoid overnight overdrafts and any imbalance between each day's demand for and supply of balances likely would produce a sharp move in the federal funds rate. To help control volatility in the funds rate, the primary credit rate and the interest rate paid

⁶ Of course, policymakers could choose to replace reserve requirements with voluntary balance targets without lengthening the maintenance period, or to retain reserve requirements (as in option 1) and lengthen the maintenance period.

⁷ The interest rate paid on excess balances and the primary credit rate, together with the penalty rate charged on any shortfall, would form a symmetric corridor around the target for the federal funds rate. The remuneration rate on excess balances is likely to set a floor on the federal funds rate. The primary credit rate, however, might not provide a hard ceiling on the funds rate. It is interesting to note that the Bank of England normally maintains a ± 100 basis point corridor, but its corridor narrows to ± 25 basis points on the last day of its roughly one-month maintenance period to avoid large end-of-period rate movements.

on excess balances could be set narrower relative to the funds rate target than in the preceding two options, for example, they could be set at 25 basis points on either side of the target for the funds rate, as in Australia and Canada. Day-to-day variability in the funds rate within this corridor is likely to be high unless the Desk were able to observe each day's realized demand for balances and adjust the supply of balances late in the day to make supply equal to quantity demanded. (Canada and other countries that use option 3 do so, but their methods are unlikely to be feasible in the United States.) If the supply of balances fell short of the need and the Desk did not adjust the supply of balances late in the day, the federal funds rate would rise at least to the primary credit rate and some banks would be forced to use the discount window. If the supply of balances were to exceed demand, the funds rate would fall to the "deposit rate."

Option 4: Floor with High Balances

This option should generate a stable federal funds rate with no required or target balances and only very modest administrative costs for the Federal Reserve and depository institutions. Depository institutions would have little incentive or need to manage their balances on a day-to-day basis, so federal funds trading could diminish substantially. Option 4 is like the approach used by the Reserve Bank of New Zealand.

Under this option, the Federal Reserve would remunerate balances held by depository institutions at a rate perhaps 10 to 15 basis points below the target for the federal funds rate; the spread would be chosen to make the rate paid on balances (a risk-free asset) equal to the risk-adjusted return from lending federal funds at the target fed funds rate.⁸ The Desk would provide abundant balances—more than banks would choose to hold to avoid overnight overdrafts and meet clearing needs—thus driving the funds rate down to the level at which depository institutions see the risk-adjusted return from selling federal funds as equal to the return from holding balances at a Reserve Bank. Once the funds rate falls to that level, the demand for balances would become perfectly elastic and further additions to the supply of balances would have no effect on the federal funds rate.

Option 4 envisions that the Desk would supply enough balances to keep banks in the perfectly elastic portion of their demand schedules every day; this level might be on the order of \$35 billion but could be larger on some days. The Desk would not have to adjust reserve balances on a daily basis; it could supply balances through occasional outright operations and long-term repurchase agreements. The Desk might sometimes need to conduct temporary adding operations to accommodate unusually large transitory increases in the demand for balances or to offset unusually large changes in autonomous factors, but such operations likely would be rare.

Changes in the FOMC's target for the federal funds rate would be accompanied by a change in the remuneration rate on balances. This feature highlights a governance issue

⁸ The spread between the interest rate on unsecured overnight federal funds transactions and secured overnight GC repo transactions usually is 10 to 15 basis points, suggesting that the remuneration rate on balances would need to be 10 to 15 basis points below the target for the federal funds rate. The interbank rate in New Zealand averages about 15 basis points above the rate the Reserve Bank pays on balances.

that applies in varying degrees to all of the options discussed in this paper: By statute, the Board will set the remuneration rates on balances, but the FOMC sets the target for the federal funds rate.

With ample balances earning a rate of return equal to the risk-adjusted federal funds rate, depository institutions would have little need or incentive to manage their balances carefully and could reduce the resources they devote to that activity. The high level of, and elastic demand for, balances probably would imply a reduction in federal funds trading because fewer banks on average would find themselves short of balances. Still, on any given day, some banks might find themselves with smaller balances than they want; they would bid up the federal funds rate to some extent, thereby inducing other banks to lend federal funds and hold somewhat smaller balances. During periods of financial stress, however, institutions might find holding remunerated risk-free balances at the Federal Reserve much more attractive than lending federal funds to counterparties with unknown risk profiles. In this case, the federal funds market might become illiquid and the spread between the federal funds rate and the remuneration rate on deposits might widen appreciably even if the Desk increased the supply of balances substantially.

In part to deal with the possibility described above, a variant of option 4 would impose, on each depository institution, an upper limit on the quantity of balances that would receive full remuneration. If the Desk keeps the total supply of balances below the sum of the upper limits, the funds rate should remain at or near the target rate. The limits, however, would give any institutions that have a surfeit of funds an incentive to sell federal funds to institutions that need additional balances.⁹

Option 5: Wide Daily Band

Option 5 would eliminate reserve requirements and establish new, voluntary, *daily* balance targets along with associated wide bands around those balance targets. A depository institution could choose a daily target level for its end-of-day balance and could change its target balance perhaps once per month. The institution would earn a rate equal to or slightly below the target federal funds rate on all end-of-day balances up to the upper limit of its target balance band. (The target balance band might be set at plus or minus 50 percent of the balance target.) Balances in excess of this band would be remunerated at a lower rate; any shortfall in balances below the bottom of its target balance band would be subject to a penalty fee. Balances held by an institution that chose not to establish a voluntary balance target would earn interest at the rate paid on “excess” balances. These features of option 5 would give each institution an incentive to choose a target balance with an associated band that spans its needs for operating balances, and to use the federal funds market to manage its balance to stay within its target band each day.¹⁰ There would be no averaging or carryover from one day to the

⁹ The Reserve Bank of New Zealand recently imposed upper limits to deal with what it saw as one institution’s unreasonably large balances.

¹⁰ Option 5 could yield a reduction in federal funds trading even as it stabilizes the federal funds rate. Banks that chose a high balance target and associated wide target band would have little incentive or need

next. Administrative burdens would be modest, but it would be necessary to develop systems to track institutions' balance targets and their maintained balances relative balance targets on a daily basis.

If institutions chose large enough daily balance targets so they have ample working balances even if their actual balances lie at the lower end of their target bands, option 5 should result in a stable funds rate. Each day's demand for balances would be elastic within the wide daily target balance band, so a "miss" that left the day's supply of reserves below or above the notional target but within the target balance band would have very little effect on the funds rate. But the demand for balances could be quite inelastic outside of the target range, so the federal funds rate could move sharply away from its target if the supply of balances were to breach the upper or lower bound of the daily target balance band. Option 5 would rely on the primary credit facility and the low remuneration rate on above-band balances to limit movements in the funds rate in such cases.

Under option 5, the Desk probably would conduct daily open market operations, as it does today. The Desk normally would aim to supply a quantity of balances roughly equal to the sum of institutions' daily targets; as today, the Desk likely would supply larger amounts on high-payment-flow days.

to lend or borrow in the federal funds market until their balances approached the upper and lower limits of their target bands, and thus could reduce the resources they devote to managing their Federal Reserve accounts.

Table 1: Key Structural Elements of Five Options						
	Bounds on Interbank Rates (1)		Quantity Requirements or Target Balances (2)	Length of Maintenance Period (3)	Flexibility in Meeting Requirements or Target Balances (4)	Rate at which Balances Are Remunerated (5)
	Upper	Lower				
Memo: Current U.S.	<i>Target+100/25¹¹</i>	<i>0</i>	<i>Mandatory Requirements & Contractual Targets</i>	<i>14 Days & 7 Days</i>	<i>Carryover for required; Clearing band for contractual</i>	<i>Contractual clearing balances: earnings credits at 80% of 3-mo. bill yield; Other balances: zero</i>
Option 1	Target FFR +100	Target FFR -100	Mandatory	14 Days	Carryover	Required: Target FFR Excess: Target FFR-100
Option 2	Target FFR +100	Target FFR -100	Voluntary target balance	Period Between FOMC Meetings	Narrow band of monthly average balance around voluntary target balance	Within target band: Target FFR Outside of target band: Target FFR-100
Option 3	Target FFR +25	Target FFR -25	None	N/A	N/A	Target FFR-25
Option 4	Target FFR +100	Target FFR -15	None, or perhaps an upper limit for full remuneration	N/A	N/A	Within limit for full remuneration: Target FFR-15 Beyond limit for full remuneration: Target FFR-100
Option 5	Target FFR +100	Target FFR -100	Voluntary target balance	1 Day	Wide daily band around daily voluntary target balance	Up to upper end of target balance band: Target FFR Above target balance band: Target FFR-100

¹¹ The spread had been 100 basis points since the establishment of the primary credit facility in 2003. The spread was reduced to 50 basis points in August 2007 and to 25 basis points in March 2008. As with all the options considered in this study, this spread is a variable parameter, as would be the rate paid on excess reserves under most of the options. For this study, we will use a 100 basis point spread to represent a “conventional” spread for a lending and discount facility under regimes with multi-day maintenance periods and some form of required or voluntary reserve levels as this reflects the most common practice among central banks.

Choosing Among the Options

The breadth of the range of options under consideration and the objectives against which they can be evaluated pose challenges for comparison. The options differ in the extent to which they satisfy the objectives, with each having distinct benefits, potential disadvantages, and some areas of uncertainty. This section highlights key aspects of each option to facilitate comparisons and offers reasons why policymakers may wish to choose one rather than another. Table 2 at the end of this section summarizes some pros, cons and open issues for the various options.

The options have several common features that provide substantial advantages over the current system of monetary policy implementation. By either reducing reserve requirements to zero or by remunerating balances held to satisfy those requirements at the target rate, all options eliminate the reserve tax, a primary motive for the Federal Reserve in seeking authority to pay interest on reserves. All options set a floor under the federal funds rate, although in different ways. This minimum value for the overnight rate and the flexibility to change it or other aspects of the operating mechanism may be particularly useful during periods of financial stress.

Policymakers might choose **Option 1, Remuneration of Required and Excess Reserve Balances**, if they were reluctant to make significant changes to the current system but wanted to remove the reserve tax. This option would operate much like the current system, except that paying interest on excess reserves would establish a floor under the funds rate. In times of financial stress, the Board would be able to adjust the rate paid on excess reserves as well as the discount rate, a feature shared by options 2 and 3. Essentially this approach is used successfully by the European Central Bank. A key disadvantage of this approach relative to all other options considered is that substantial administrative burdens on DIs and the Federal Reserve System would remain in place.

If policymakers were comfortable making a somewhat larger change in the implementation of policy and valued a further reduction of administrative burdens, they might choose **Option 2, Voluntary Balance Targets**. This system likely would function about as well as the current system in terms of control over the federal funds rate. The same virtues in times of crisis that are present for the first option are present here. Administrative burdens, though reduced sharply relative to the first option, would likely be higher than under the options considered below.¹² An approach much like option 2 is used effectively by the Bank of England.

A significant source of uncertainty associated with option 2 is that the level of voluntary balance targets that depository institutions will choose is unknown; there is some risk that the aggregate level of voluntary balance targets might be too low to promote intraperiod arbitrage of the funds rate.

¹² For example, the Federal Reserve would need to maintain a system that tracks voluntary balance targets for a potentially large number of institutions, computes average balances over a maintenance period for each institution, and computes penalties when balances are not sufficient to meet the voluntary balance target.

If policymakers valued the greatest reduction in administrative burden, they might choose **Option 3, Simple Corridor**. Under this option, DIs would only have to monitor their accounts for overdrafts, and the Federal Reserve would not need to spend resources monitoring any type of requirement. If the corridor between the primary credit rate and interest rate paid on balances were relatively narrow, large deviations of the federal funds rate from the target rate would be eliminated (assuming that the primary credit rate acted as a hard cap on the funds rate). Moreover, the Board would be able to narrow the width of the corridor if policymakers wanted to more tightly control the federal funds rate in a financial crisis. Option 3 is used successfully in Canada and Australia, but this approach has not been used in an economy with as many and as varied depository institutions as in the United States.

Relative to the others, this option relies more heavily on standing facilities to stabilize the federal funds rate. A disadvantage of option 3 relative to all of the others is that the federal funds rate would very likely become more volatile on a day-to-day basis, though within a relatively narrow corridor. Without a mechanism to create an elastic demand for balances—as in the previous two options—or an effective means of pegging the overnight rate to the target rate—as in the subsequent two—the overnight rate might fluctuate from the top to the bottom of the corridor both across and within days. This volatility could impair market liquidity, particularly during times of financial stress.

An option that likely would reduce volatility of the federal funds rate while creating a simple operating environment is **Option 4, Floor with High Balances**. Like option 3, this option would eliminate all burdens and costs associated with reserve requirements for depository institutions as well as the Federal Reserve. By providing an ample supply of balances, this approach should drive the federal funds rate down close to the floor rate the Federal Reserve pays on balances and stabilize the funds rate at that level. Moreover, the funds rate likely would not be sensitive to fluctuations in the supply of balances that result from forecasting errors. During normal times, the Desk's daily reserve management would be simplified. During times of financial stress and illiquidity, such as the period since August 2007, the Desk could provide significantly more balances without causing the funds rate to drop below target.

Supplying the high level of balances envisioned under option 4, even in normal times, could require a substantial expansion of the Federal Reserve's balance sheet. The high level of balances might mean that fewer institutions would need to borrow federal funds, so interbank lending could well be reduced. The federal funds market might become a less efficient mechanism for distributing funds under normal circumstances, and less capable of re-distributing funds in the face of reserve shocks. On the other hand, the costs that depositories incur from having to actively manage their reserve accounts would be reduced. Especially risk-averse DIs might choose to "hoard" funds, particularly in crisis scenarios, which has the potential to reduce Federal Reserve control over the federal funds rate. Although the Reserve Bank of New Zealand successfully uses a similar system, the much smaller banking system in that country makes it problematic to draw inferences from that experience for the United States. A governance issue that

comes to the fore particularly in this option, though it may also be present in some others, is the fact that the remuneration rate on balances—which would be set by the Board, rather than the FOMC—would effectively determine the federal funds rate.

If policymakers found the fairly tight control over the target federal funds rate of the previous option appealing, but were concerned that the level of balances required to implement Option 4 could be too high, they might choose **Option 5, Wide Daily Band**. Under this option, DIs would bear some administrative burden associated with account management, and the Federal Reserve System would bear some burden associated with tracking the voluntary targets, but these burdens would be reduced relative to the current operating environment. Although liquidity in the federal funds market could be impaired if target balances are rather high, the limits to the bands would encourage institutions to manage their accounts more actively than under option 4, though perhaps less actively than in some of the other options.

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Table 2: Pros, Cons and Open Issues of Five Options				
(1) Remunerate Required & Excess Reserve Balances	(2) Voluntary Balance Targets	(3) Simple Corridor	(4) Floor with High Balances	(5) Wide Daily Band
Similar to approach used by European Central Bank.	Similar to approach used by Bank of England.	Similar to approach used by Canada and Australia.	Similar to approach used by New Zealand.	
<ul style="list-style-type: none"> Eliminates reserve tax. Could reduce account management burden on DIs. Sets a floor on the funds rate. In periods of market turmoil, can adjust floor on funds rate (as well as discount rate). 	<ul style="list-style-type: none"> Eliminates reserve tax. Reduces account management burden on DIs. Lowers administrative burden on banks and FRS. Sets a floor on the funds rate. In periods of market turmoil, can adjust floor on funds rate (as well as discount rate). 	<ul style="list-style-type: none"> Eliminates reserve tax. Sharply reduces account management burdens on DIs. Eliminates administrative burden on banks and FRS. Prevents large deviations of funds rate from target. In periods of market turmoil, can adjust floor of corridor (as well as discount rate). 	<ul style="list-style-type: none"> Eliminates reserve tax. Sharply reduces account management burdens on DIs. Eliminates administrative burden on banks and FRS. Sets a floor on the funds rate. Likely would keep funds rate near floor. In periods of market turmoil, can separate provision of liquidity from the target rate. Simplifies Desk's daily reserve management. 	<ul style="list-style-type: none"> Eliminates reserve tax. Reduces account management burden on DIs. Lowers administrative burden on banks and FRS. Sets a floor on the funds rate. Likely would keep funds rate near target. In periods of market turmoil, can adjust reserve targets and clearing bands. Could simplify Desk's daily reserve management.
<ul style="list-style-type: none"> Retains complex structure and burdensome administration of reserve requirements. Incurs some deadweight losses from reserve avoidance. 	<ul style="list-style-type: none"> Modest administrative burden for FRS associated with tracking voluntary targets. 	<ul style="list-style-type: none"> Funds rate would be more volatile, though within a narrow corridor. Has not been used in an economy with many banks. 	<ul style="list-style-type: none"> Has not been used in an economy with many banks. 	<ul style="list-style-type: none"> Modest administrative burden for FRS associated with tracking voluntary targets. No experience with this type of system.
	<ul style="list-style-type: none"> Need to determine what remuneration rate (and other details of this approach) will lead DIs to choose targets that are large enough to yield an elastic demand for balances and stable funds rate. 	<ul style="list-style-type: none"> Banks may or may not borrow readily from Federal Reserve lending facility. Could reduce trading volume and liquidity in federal funds market, with potential costs and benefits. 	<ul style="list-style-type: none"> The Desk's leverage over funds rate may diminish in certain crisis scenarios. Could significantly reduce trading volume and liquidity in federal funds market, with potential costs and benefits. Could decrease correspondent banking activity. Maintaining the FOMC's funds rate target may require that the Board change the remuneration rate on balances. 	<ul style="list-style-type: none"> Need to determine what remuneration rate (and other details of this approach) will lead DIs to choose targets that are large enough to yield an elastic demand for balances and stable funds rate. Could reduce trading volume and liquidity in federal funds market, with potential costs and benefits. Could decrease correspondent banking activity.

II. Introduction

The Financial Services Regulatory Relief Act of 2006 allows the Federal Reserve to pay interest on Fed account balances held by depository institutions beginning in 2011. In addition, the act allows the Federal Reserve to reduce reserve requirement ratios to as low as zero.¹³ This paper presents a wide range of options for monetary policy implementation that the Federal Reserve might consider as a result of this new authority.

The remarks of Vice Chairman Kohn in congressional testimony in June of 2004 indicate why this new authority is important and provide an important backdrop for much of the discussion in this paper.

“...unnecessary legal restrictions on the payment of interest on demand deposits at depository institutions and on balances held at Reserve Banks distort market prices and lead to economically wasteful efforts by depository institutions to circumvent these artificial limits. In addition, authorization of interest on all types of balances held at Reserve Banks would enhance the toolkit available for the continued efficient conduct of monetary policy. And the ability to pay interest on a variety of balances, together with increased authority to lower or even eliminate reserve requirements, could allow the Federal Reserve to reduce the regulatory and reporting burden on depository institutions of reserve requirements.”

Consistent with these remarks, the Federal Reserve has begun the process of evaluating options for monetary policy implementation that make use of the new authorities granted by the Financial Services Regulatory Relief Act. At the direction of the Chairman, the Director of the Division of Monetary Affairs at the Board established a task force to conduct a preliminary study of plausible options that the Federal Reserve might consider. The task force included members from the Board and Federal Reserve Banks of Minneapolis, New York, and Richmond. The group was asked to develop options for monetary policy frameworks and evaluate them based on four key criteria—reduction in burdens and deadweight losses associated with the current system of reserve requirements, effectiveness in the implementation of monetary policy, promoting the efficiency and resilience of money markets and government securities markets, and promoting the efficiency and resilience of the payment system. The analysis below attempts to identify many of the salient policy issues associated with various options. The aim is to offer analysis that could be helpful to policymakers in organizing their own thoughts about various options and that would also help to facilitate discussion of the key issues. With direction and input from policymakers, the staff expect to narrow the number of options under active consideration and to then conduct a “stage two” study of the most promising options. The stage two studies would go into much greater detail about the structure and operation of each system and the steps that would be required to implement each system.

¹³ Relevant provisions of the Act are shown in appendix A.

The remainder of the paper is organized as follows. Section III provides a brief overview of the key objectives for any candidate system of monetary policy implementation. Section IV outlines five basic options for monetary policy implementation frameworks that were viewed as worthy of consideration. These options were selected as possibilities that span a range of the types of systems used in many other countries and that appeared to have some attractive features. The discussion in this section includes a review of policy issues for each option judged against the four key objectives noted in section III. Section V discusses some general issues that cut across all of the options.

III. Overview of Objectives

Each of the options presented in this paper is evaluated against four criteria that constitute basic objectives for a monetary policy implementation framework: (1) the impact on distortions and deadweight loss to banks, the financial system and society; (2) the effectiveness as an operational framework for implementing monetary policy and achieving operating objectives; (3) the impact on the efficiency and the resiliency of the money market and government securities markets; and (4) the implications for the payments system and compatibility with Federal Reserve Payment System Risk policies.¹⁴ As compared to the current framework, the implications of various options for some of the objectives seem straightforward, in others any effects may be negligible, and in others still the direction of any impact may be clear but the magnitude of any effect difficult to measure with confidence. In the remainder of this section, each of these objectives is described in more detail.

Impact on distortions and deadweight loss to banks, the financial system and society

In the current system, balances held to meet reserve requirements are not remunerated, so these requirements represent a “tax” on depository institutions, because banks can neither lend nor earn a return on the balances held to satisfy these requirements. This reserve tax is a direct distortion, and even where it has been effectively evaded by depository institutions, the expenditure of productive resources to avoid reserve requirements represents a cost to society. The current system for administering reserve requirements is also quite complicated and presents a considerable burden and cost to the thousands of depository institutions affected and the Federal Reserve.¹⁵ Additionally, the lack of remuneration on excess reserves, along with the penalties associated with not fulfilling Federal Reserve regulatory and contractual obligations for holding reserves, impose potential costs on banks that could result in their devoting more resources to the management of reserve positions beyond what would otherwise be needed for prudent balance sheet management. Each option is evaluated in terms of its impact on the above sources of distortion, weighed against any new administrative requirements and associated costs that it would introduce.

Effectiveness as an operational framework for implementing monetary policy and achieving operating objectives

For purposes of this paper, the workgroup has assumed that the overnight interbank rate—that is, the federal funds rate—remains the operating target of the Federal Open Market Committee. The current arrangements for implementing monetary policy provide

¹⁴ The implications of the various options for the Federal Reserve pro forma balance sheet and priced services, through the possible elimination or impact on the current contractual clearing balance program, are currently under review by a System task force focusing on the operational implications of the basic options identified in this study.

¹⁵ The administration of the current system of reserve requirements is presented in some detail in an accompanying memo entitled “Implementing Monetary Policy in the United States: the Policy Framework and Operating Procedures.”

very efficient tools for adjusting the aggregate level of reserves in a manner consistent with achieving a target for the federal funds rate. These mechanisms, and the associated structure of the domestic portfolio, might be little different under some of the options considered, but some of the alternatives could have important implications for the conduct of open market operations and the domestic portfolio even under normal circumstances.

Under the current framework, the Open Market Desk (the Desk) has been largely successful in meeting its operating objective of keeping the overnight federal funds rate on average around the target rate established by the FOMC, at least under ordinary conditions. The ability of the Desk to achieve its operating objectives under the current regime under more extraordinary circumstances is less certain, depending on the specific nature of those circumstances. For example, during the financial market turmoil that began in August, the generous provisions of liquidity designed to promote market function resulted in many days when the funds rate traded well below the target rate, and many measures of volatility were exceptionally high. Each of the options is evaluated for its likely effectiveness in enabling the Desk to achieve its operating objectives, and for its implications for open market operations and the domestic portfolio, during times of financial market stress or whenever supply or demands for reserves are subject to an extraordinary degree of volatility or uncertainty.

Impact on the efficiency and resiliency of the money market and government securities markets

Each of the options will be evaluated in terms of its likely or possible impact on the money market—specifically the federal funds market but other segments of the money market as well—and also the government securities market. The behavior of the federal funds rate is evaluated as part of the previous objective; here we focus more on the implications for the structure and functioning of this market, including its uses, trading levels, and overall participation.

Under the current framework, the federal funds market plays a central role in banks' management of reserves in the face of payment shocks and more broadly supports their asset-liability management. It plays an important role in the transmission mechanism of monetary policy. With current aggregate levels of requirements somewhat low, and no interest paid on excess balances and penalties associated with deficiencies, institutions with either a surplus of funds or facing a shortage have strong incentives to trade. The result is an active market. Under some of the options, the role of the funds market in banks' balance sheet management and overall trading activity could be altered. We consider whether changes in market structure would leave important market needs going unfilled or whether the funds market would cease effectively meeting the critical roles it would still be expected to play. The effectiveness and resiliency of the funds market in times of financial market stress is of special interest. Finally, we take particular note of the possible impact of various options on the market for Treasury debt, for example, through the impact on the publicly available supply of Treasury debt and other risk-free assets.

Implications for the payments system and compatibility with Federal Reserve Payment System Risk policies

The monetary policy implementation framework and the payment system interact in important ways. The level of balances held by depository institutions, and the facility with which they may be transferred between institutions, may substitute to some degree for daylight credit. Federal Reserve payment systems risk policies are designed to reduce risk to the Federal Reserve while still promoting the smooth processing of payments intraday. The Board has recently proposed the introduction of two-tier pricing, with a higher fee imposed on uncollateralized daylight overdrafts and a lower fee on collateralized daylight overdrafts. Each of the options is evaluated in terms of its likely impact on the demand for daylight credit, the smooth functioning of the payments system, and compatibility with current or a two-tier pricing structure for intraday credit.

IV. Detailed Discussion of Options

Option 1: Remunerate Required and Excess Reserve Balances

- *Summary and Important Policy Issues*

Under the basic version of option 1, the Federal Reserve would pay interest on required reserve balances (RRB) and on excess reserves but retain nearly all other elements of the current system of monetary policy implementation. The combination of the primary credit program and the remuneration of excess reserves should create a corridor for the federal funds rate. The so-called reserve tax would be largely eliminated but many of the costly aspects of reserve administration would remain in place, both for depository institutions and the Federal Reserve. A variation on the basic option could incorporate a number of measures to greatly simplify reserves administration. One promising possibility would be to greatly reduce the frequency of reporting required for the determination of required reserves and to make other adjustments so that all depositories would be on the same two-week maintenance period. In both the basic option and this simplified reserves administration variation, the Desk would presumably operate in much the same manner as it does today in managing reserves on a day-to-day basis, although the daily and maintenance period average demands for excess reserves might be boosted and become somewhat more interest elastic. The lower bound on the federal funds rate created by the remuneration of excess reserves would likely be a particularly useful feature during periods of market stress. A significant question concerning this option is the extent to which retail sweep programs implemented beginning in the mid-1990s might tend to unwind. A substantial unwinding of such arrangements would tend to boost the level of required reserve balances and possibly depress the level of required clearing balances. The latter effect could have implications for Federal Reserve priced services.

- *Key Structural Elements*

Option 1 would preserve nearly every aspect of the current system of monetary policy implementation. Reserve requirements would remain in place and all aspects of the current system for deposit reporting, the calculation of reserve requirements, and the maintenance of reserves against requirements would be retained. The only departure from the current system would be the payment of interest on balances held to satisfy reserve requirements at a rate equal or close to the target federal funds rate and the remuneration of excess reserves at a rate set appreciably below the target federal funds rate.

A variation on this basic option would involve a substantial simplification of many aspects of reserves administration including the current structure of deposit reporting, reserve requirements and reserve maintenance. This simplified reserves administration variation would entail a major overhaul of the current system of deposit reporting that is used both for computing reserve requirements and in the construction of the monetary aggregates. As noted above, this system involves about 3,500 depository institutions that

report deposit data on a weekly basis. Based on these data, reserve requirements are calculated over a two-week computation period and reserves are held against these requirements over two-week maintenance periods. In addition, about 5,000 depository institutions report deposits over one week each quarter. These deposit data determine the institution's reserve requirement over the upcoming quarter; depository institutions maintain reserves against this requirement over one-week maintenance periods. This structure is inherently complicated and imposes substantial reporting burdens on depository institutions that report deposit data on a weekly basis; in addition, the transition over time of banks from the quarterly deposit reporting status to weekly reporting status, and vice versa, along with the associated changes in maintenance periods is one of many sources of complexity for the Federal Reserve in administering the system.

Under a simplified system, deposit reporting, the determination of reserve requirements, and the maintenance of reserves would be identical for all depository institutions. All depositories would report deposit data for one week in the first and third quarters of each calendar year. These deposit data would determine each institution's reserve requirement over a subsequent twenty-six week period. Depository institutions would maintain reserves against this requirement over thirteen two-week maintenance periods. The Board might also wish to consider a number of other simplifications including the elimination of tranche loss adjustments that are currently applied when two depositories merge. In addition, the current system of "as-of" adjustments to reserve positions to address the financial implications of various errors could be transitioned to one in which the net benefits or costs to depositories from such errors are processed as simple charges or credits to their reserve accounts. Finally, the Board could eliminate the current very complicated provisions governing reserve carryover in favor of a model in which depositories must meet their requirement each period with a small buffer around their requirement to allow for some flexibility.

Under both the basic model and the model with simplified reserves administration, the Board would set the rate of interest paid on required and excess reserve balances. The Board could establish a formula for determining these rates; for example, they might be set automatically based on the level of the target federal funds rate. It is worth noting that the level of the rate that is paid on required reserve balances is unlikely to have a material effect on banks' demand for reserves within a maintenance period and the observed federal funds rate as long as banks must meet their requirement within a fairly narrow band. As noted below, the rate of remuneration on excess reserves, however, would likely have quite substantial effects on banks' demand for reserves.

- *Effectiveness of Monetary Policy Implementation*

Under this option, the opportunity cost of holding excess reserves would be given by the difference between the target funds rate and the rate of remuneration on excess reserves. This spread might be set at, say, 1 percentage point—a level that would be significantly lower than the opportunity cost of holding excess reserves in most circumstances under the current system of monetary policy implementation. Moreover, if this spread were

fixed over time, the opportunity cost of holding excess reserves would not vary with the level of short-term interest rates as is the case today. The demand for reserves in this option might look like that shown in the top panel of exhibit 1.¹⁶ In view of the generally lower level of opportunity costs of excess reserves, one might expect to observe a somewhat higher level of excess reserves under this option than under the current system, particularly among the group of smaller depository institutions where excess reserves are currently concentrated.

Perhaps more importantly, the payment of interest on excess reserves would likely have some important effects on intra-period reserve demands. In determining their desired reserve holdings each day, depositories currently must balance the risk of incurring an overnight overdraft or penalties for reserve requirement deficiencies against the opportunity cost of holding positive excess reserve balances. This tradeoff often leads banks to be rather cautious in holding large positive excess reserve positions early in the period and also on Fridays (which receive a three-day weighting in reserve maintenance calculations). The payment of interest on excess reserves will lower the potential opportunity costs associated with a positive excess reserve position at the end of the maintenance period. As a result, one might expect that banks will be less inclined to run short on reserves early in the period and also on Fridays. More generally, the demand for reserves might be expected to be somewhat more interest elastic within the maintenance period. For example, when the funds rate falls below target, depositories should be somewhat more willing to hold higher reserves on the day because the potential cost of ending the period with a large excess reserve position is lower. Finally, the payment of interest on RRB at close to the target federal funds rate should tend to damp the so-called anticipation effect associated with expected policy actions at FOMC meetings. At present, when the FOMC is expected to change the target rate, banks tend to shade their demand for reserves so as to minimize the opportunity cost of holding reserves. So if the FOMC is expected to tighten, banks tend to hold sizable excess reserve positions in the maintenance period prior to the FOMC decision. And conversely, if the FOMC is expected to ease, banks tend to shift some of their demand for reserves to later in the period. However, if interest on RRB is paid based upon the target rate in effect on each day of the maintenance period, the opportunity cost of holding reserves to meet requirements will be close to zero throughout the maintenance period regardless of anticipated monetary policy actions. As a result, some of the shifting of reserve demands that we currently observe around FOMC dates should be attenuated.

As is the case today, the Desk would need to prepare estimates each day of the quantity of reserves to supply that will meet demand at the target federal funds rate. While day-to-day reserve management might not change much, there could be some important side effects of paying interest on required reserve balances that might affect the aggregate level of demand for reserve balances. For example, vault cash held by banks would not earn interest, so it is possible that depository institutions would seek to satisfy a larger

¹⁶ The chart depicts the demand curve on the last day of the maintenance period. On prior days in the period, the demand curve would have a similar shape, but the curve would exhibit a flat region around the level of required reserve balances reflecting the fact that any reserve shortfalls or excesses within the period can often be offset on subsequent days.

portion of their requirement with balances rather than vault cash. In some cases, this might even lead to institutions choosing to become “bound” by reserve requirements. (Note that the statutory language only provides authority for payment of interest on reserve balances, so paying interest on vault cash, even if it were desirable, is not authorized). In addition, a very important practical issue under this option would be the extent to which retail sweep programs might unwind. A substantial unwinding of retail sweep programs might raise the level of required reserve balances. A sizable increase in required reserve balances, in turn, could spur some decline in contractual clearing balance requirements. However, it seems likely that total required balances in this scenario would rise. If so, greater scope for arbitrage across the maintenance period might reduce the impact of special daily influences on reserve demands.

Under the simplified reserve administration variation, all of the points noted above concerning potential impacts on reserve demand, vault cash holdings, and the possible unwinding of sweep programs would also be applicable. The move to a two-week maintenance period for all depository institutions under this variation could have implications for daily reserve demands and open market operations. In particular, the “mini-settlement day” on the first Wednesday of each two-week maintenance period associated with smaller depositories that currently maintain reserves on a one-week basis would be eliminated. This effect, however, is likely to be very small.

Under both versions of option 1, the Federal Reserve would likely be better positioned to address some of the difficulties commonly observed during periods financial strains. With an effective lower bound on the funds rate provided by remuneration of excess reserves, ample supplies of reserves could be provided in the morning to address firmness in the funds market without the risk of causing a sharp plunge in the funds rate toward the end of the day. Indeed, in a crisis, the Federal Reserve might consider raising the rate of remuneration on excess reserves to a level closer to the target federal funds rate to provide even more stability in the daily funds rate. Raising the rate of remuneration on excess reserves in a crisis, however, would need to be done with care. While this step presumably would provide greater stability for the funds rate in a crisis, it might also make some banks content to hold excess reserves at the Fed rather than provide liquidity to other depository institutions and market participants, potentially exacerbating overall market strains.

- *Distortions and Deadweight Losses*

As noted above, the basic remunerate required and excess reserves option would eliminate a major source of deadweight loss—the so-called reserve tax would be substantially reduced. Depository institutions might still attach some costs to holding required reserve balances stemming from capital costs and a sense that alternative assets might have a higher risk-adjusted return.

While the direct reserve tax would be much attenuated, this option would leave in place the costly and complicated system currently employed for collecting deposit information

from banks and the similarly costly infrastructure devoted to reserve calculation and administration.

Under the simplified reserves administration model, basing required reserves on a semi-annual deposit report and simplifying reserve maintenance periods would offer some potential for a reduction in burdens associated with the current deposit reporting systems for both depository institutions and the Federal Reserve. However, without additional statutory changes, some of the complications of the current system would remain. In particular, reserve requirements would still be based on transaction deposits only. Also, the statutory provisions for reserve requirement exemptions and a low reserve requirement tranche, which add complexity to the current scheme, would still apply in the “simplified” system. In addition, the transition costs in moving from the current reporting system to a simplified reporting system could be substantial.

- *Efficiency and Resilience of Money Markets and Government Securities Markets*

The effects of the basic interest on reserves option and simplified reserves administration variation on money markets and government securities markets would appear to be rather modest. Both options could produce some unwinding of retail sweep programs and this ultimately could result in a larger SOMA portfolio as the Federal Reserve acts to supply additional reserves to meet the higher level of reserve requirements. In principle, this could put some downward pressure on Treasury yields although this effect seems likely to be modest. The unwinding of retail sweep programs could have some minor effects on money market mutual funds. In most cases, funds swept under retail programs are swept into savings deposits, but some are swept into overnight investments in money market mutual funds. The unwinding of these arrangements would then represent a net loss of funding to some mutual funds that would, in turn, lead to some reduction in assets held by these funds.

- *Efficiency and Resilience of the Payment System*

Both the basic interest on RRB and excess reserve option and the variation with simplified reserves administration might have some impact on the Federal Reserve’s pro-forma balance sheet used as the basis for establishing fees for priced services. Currently, the pro-forma balance sheet calculations assume that a portion of the Federal Reserve’s assets are non-interest-earning reserves held to meet notional reserve requirements on contractual clearing balances. With the remuneration of required reserve balances in option 1, these pro-forma balance sheet calculations would presumably need to impute interest earnings on the “reserve requirement” assessed against contractual clearing balances. Moreover, as noted above, retail sweep arrangements might unwind substantially, increasing required reserve balances. In this case, the level of contractual clearing balances might fall, possibly with significant consequences for the pro-forma balance sheet calculations.

Both versions of option 1 could also boost the aggregate level of end-of-day balances if retail sweep programs were to unwind significantly. At the margin, this would tend to

reduce intraday credit extensions, although the impact on daylight credit from this source seems likely to be rather modest.

Both options are likely to create incentives for depository institutions to economize on vault cash relative to current circumstances. It seems unlikely that this would have a material impact on the availability of cash to the public, but it might lead more banks to explore options that could produce something closer to “just-in-time” cash delivery. One way this might be accomplished could be through greater use of the so-called Custodial Inventory Program in which depository institutions essentially agree to operate a cash warehouse for the Federal Reserve on their own premises. This trend might create higher costs for the Federal Reserve in overseeing the operations of such cash programs.

- *Transition Issues*

The transition to the basic model outlined under option 1 would entail fairly modest adjustments relative to some of the other options, but a number of issues would need to be addressed. At the most basic level, the Federal Reserve would need to develop systems and procedures to effect the payment of interest on reserves and to properly record the interest on Reserve Bank financial statements. The simplified reserves administration variation would involve more substantial transition costs. The move to a semi-annual deposit report for the determination of reserve requirements and two-week maintenance periods for all depositories would require substantial changes in automated systems. Moreover, designing and implementing a simplified set of deposit reports for a sample of institutions to support the construction of the monetary aggregates would be a significant adjustment. It may be possible to retain some of the infrastructure associated with the current system of deposit reporting for this purpose.

Option 2: Voluntary Balance Targets

- *Summary and Important Policy Issues*

Under option 2, the current system of mandatory reserve requirements and contractual clearing balance requirements would be eliminated and replaced with a system of voluntary balance targets. As in option 1, this option would also include remuneration of excess reserves at a rate appreciably below the target federal funds rate. This system would entail some administrative costs in managing the voluntary balance requirement system. However, these costs would likely be significantly lower than those associated with the current system of mandatory requirements. The remuneration of excess reserves should set a lower bound on the federal funds rate and thus limit downside movements in the funds rate. A key source of uncertainty in this option is the level of voluntary balance targets that depository institutions might wish to establish. In part, this would depend on the remuneration rate on reserves held to meet voluntary balance targets. However, all institutions would be eligible to specify a voluntary reserve target, whereas reserve requirements under the current framework are effectively limited to banks with a sufficient deposit base and clearing balance requirements are effectively limited to banks that consume sufficient priced services from the Fed. If the aggregate level of voluntary

balance targets turns out to be quite low, the reserve averaging feature of this system may not be an important consideration for banks at the margin, and the system in this case would likely behave very much as in option 3—a system with no requirements at all. Finally, the elimination of the current system of contractual clearing balance requirements under this option would have significant implications for the pro-forma balance sheet utilized in pricing Federal Reserve services.

- *Key Structural Elements*

In the voluntary balance target option, reserve requirements would be reduced to zero and the current system of contractual clearing balances with implicit interest in the form of earnings credits would be eliminated. There are many possible voluntary balance target arrangements but in one simple version of such a program, depositories would be offered the option to establish in advance a voluntary balance target for each maintenance period. The maintenance period would be set equal to the period between FOMC meetings and depositories would be required to hold balances on average over this maintenance period equal to their balance target, plus or minus a small to moderate-sized band. Shortfalls in average balances relative to the target balance would be penalized. All balances held to meet voluntary balance targets would be remunerated at a rate close to the target federal funds rate. Balances in excess of the voluntary balance target would be remunerated at a lower rate set at, say, 1 percentage point below the target federal funds rate. Depositories need not establish a voluntary balance target in this system. All account balances for institutions that choose not to establish a voluntary balance target would be remunerated at 1 percentage point below the target federal funds rate. These institutions would thus manage their accounts on a day to day basis rather than on a maintenance period average basis, presumably with an eye toward holding a sufficient quantity of balances each day to avoid overnight overdraft charges while at the same time seeking to minimize the opportunity cost of holding large account balances.

- *Effectiveness of the Implementation of Monetary Policy*

Under the voluntary balance target program, the Federal Reserve could implement monetary policy much as it does today. The reserve demand curve in this option might look like that depicted in the bottom panel of exhibit 1. The primary credit rate and rate of remuneration on excess reserves would establish an upper and lower bound for the demand curve. On average, depositories would target a quantity of reserves over a maintenance period sufficient to meet their voluntary balance requirement. Similar to current circumstances, banks would also likely exhibit some variation in daily demands for balances. Assuming that banks in the aggregate set sufficiently high balance targets, the Desk would likely operate in a manner similar to that under current arrangements; open market operations could be conducted on a fairly frequent basis with an eye toward meeting daily demands for balances while making satisfactory progress toward supplying an appropriate average quantity of reserves to meet period-average reserve needs. To some degree, the need to conduct daily fine-tuning operations might be attenuated by the relatively long maintenance period, and the Desk might be able to provide a somewhat larger fraction of reserves through term RPs than is currently the case. This tendency

might be offset, however, if the aggregate level of voluntary balance targets proved to be fairly low. In this case, the scope for depository institutions to arbitrage their reserve holdings across days of the maintenance period could be limited; in these circumstances, the Desk might need to conduct even more fine-tuning operations than at present.

The voluntary balance target program could have advantages relative to the current system during periods of financial distress. As was the case earlier this year and in past financial crises, the Federal Reserve often wishes to provide ample liquidity during episodes of severe market distress. These actions can be helpful in settling market conditions, but can also leave the banking system with a surfeit of reserves and push the effective funds rates well below the target rate, particularly at the end of the day. In these circumstances, the Federal Reserve could temporarily raise the rate of remuneration on excess reserves to the target federal funds rate to both stabilize the funds rate and also avoid situations in which some institutions are left holding very costly large excess reserve positions. In addition, the relatively long maintenance periods for meeting voluntary balance targets under this option should be helpful during periods of financial distress by providing both banks and the Federal Reserve more flexibility in day to day reserve management.

- *Distortions and Deadweight Losses*

A voluntary balance target program would eliminate the reserve tax; depositories would have a choice about the quantity of balances they wished to hold. In addition, a voluntary balance target program would also substantially reduce reporting and administrative burdens relative to the current system. For example, there would be no need to collect deposit information for the purpose of computing a balance requirement. As described in option 1, information on deposits could be collected based on sampling techniques for the purposes of publishing the monetary aggregates. These sample reports could be benchmarked against Call Reports to arrive at estimates of aggregate deposits.

A voluntary balance target program should be relatively simple to administer. Various complexities associated with the current system of mandatory reserve requirements including enforcement, legal interpretations, tranche loss adjustments, as of adjustments, and carryover provisions could be completely or substantially eliminated.

- *Efficiency and Resilience of Money and Government Securities Markets*

It is difficult to judge the net effect of a voluntary balance target program on money markets and government securities markets. The relatively long maintenance period envisioned might imply a somewhat less active overnight federal funds market and somewhat more activity in the term federal funds market. The potential shift in activity away from overnight markets toward term funding markets could be evident in the repo market as well. The Federal Reserve's own operations might be more concentrated in term operations and this could spur a pickup in activity in term repo markets.

Aggregate balance sheet adjustments could have some modest effects in the broader government securities market. If many depositories chose to establish voluntary balance targets of significant size, the Federal Reserve's balance sheet might expand while the banking system might hold a larger volume of reserves than at present. In this case, the private sector would hold fewer Treasury securities in aggregate, and this reduction in supply might put some modest downward pressure on Treasury yields.

- *Efficiency and Resilience of Payment Systems*

The voluntary balance target program could have important implications for Federal Reserve priced services and for daylight overdrafts. The current system of contractual clearing balance requirements would be eliminated. These balances figure prominently in the pricing paradigm utilized in setting fees for Federal Reserve priced services. In particular, contractual clearing balances are an important low-cost "funding source" in the notional balance sheet calculations that underly the pricing of Federal Reserve services. It appears likely then that the elimination of such balances would adversely affect cost recovery for priced services under the current paradigm. More broadly, the elimination of contractual clearing balances might require a more fundamental revision of the framework employed for priced services.

The voluntary balance target option might also have significant implications for the usage of intraday credit. In particular, depositories might be inclined to hold larger overnight balances to reduce their reliance on intraday credit from the Federal Reserve. This might be the case even under proposals in which the fee for collateralized daylight credit is reduced to zero. Depository institutions that perceive significant costs in pledging sufficient collateral to cover their need for intraday credit could find it attractive to establish a comparatively large voluntary balance target. In effect, the voluntary target system would allow depositories to decide how much of their intraday credit needs they wish to meet by relying on (remunerated) end-of-day balances versus relying on collateralized daylight overdraft credit.

- *Transition Issues*

The transition to a system of voluntary balance targets would involve a number of steps that would need to be carefully managed. As in the simplified requirements variant of option 1, the move to a maintenance period set equal to the interval between FOMC meetings would involve substantial changes to existing automation systems. Moreover, the elimination of the existing contractual clearing balance program and the transition to the new system would require a very significant outreach effort on the part of Reserve Banks to depository institutions in their respective districts. Also, a gradual transition to zero reserve requirements under this option would present some complications. For example, a gradual reduction in reserve requirements from 10 percent to 0 percent over a period of, say, six months would imply that the current system of reserve requirements based on two-week maintenance periods would have to coexist for six months with the new voluntary balance requirement system based on a longer maintenance period. One possible way to address this type of transition issue would be to retain the existing

contractual clearing balance program during a phase-out period for reserve requirements but pay explicit rather than implicit interest on such balances. Reserve requirements could be reduced to zero over a six-month period by first reducing the 3 percent requirement on the low-reserve tranche to zero and then cutting the marginal reserve requirement on transaction deposits from 10 percent to 0 percent in increments of 2 percentage points every other maintenance period.¹⁷ At the end of the reserve-requirement phase-out period, the contractual clearing balance program could be eliminated and replaced with the voluntary balance target program. As with most options, the Federal Reserve would need to restructure its report collection for the purposes of constructing the monetary aggregates.

Option 3: Simple Corridor

- *Summary and Important Policy Issues*

This option would involve reducing reserve requirements to zero and eliminating the current contractual clearing balance program. Reserve balances would be remunerated at a rate set below the target funds rate, thus establishing a lower bound for the funds rate. The upper bound of the interest rate corridor would be established by the primary credit rate, assuming that the primary credit rate provided a reasonably hard cap. This option would eliminate many of the burdens associated with the current system of monetary policy implementation. A key source of uncertainty in analyzing this option is the slope and variability of the resulting reserve demand curve. While some demand for balances could be associated with portfolio considerations, banks' demand for reserves would likely be driven largely by precautionary demands for balances associated with clearing needs. Such demands would likely be volatile from day to day and relatively interest inelastic. This combination would tend to boost the volatility of the federal funds rate within the corridor. As a result, the corridor might need to be rather narrow to provide some offset to the tendency toward increased volatility.

- *Key Structural Elements*

Under this option, all forms of reserve requirements (including contractual clearing balance arrangements) would be eliminated. The Federal Reserve would establish a lower bound on the federal funds rate by remunerating excess reserves (which would be all reserves in this arrangement given the absence of any form of requirements) at a rate somewhat below the target federal funds rate. The Desk would be charged with maintaining interbank market rates around an operating objective or policy target

¹⁷ It is important to note that such a "straight-line" reduction in the marginal reserve requirement ratio would likely have a front-loaded effect on required reserve balances. For example, a 2 percentage point reduction in the reserve requirement ratio from 10 percent to 8 percent would be expected to reduce the level of required reserves by about \$8 billion, and this reduction in required reserves would likely show through to a drop in required reserve balances on a nearly one-for-one basis. The net result is that required reserve balances would likely drop close to zero well before the reserve requirement ratio is reduced to zero. If policymakers preferred a gradual reduction in required reserve balances, this likely would entail fairly modest reductions in reserves requirements at the outset followed by relatively large reductions in the reserve requirement ratio toward the end of the transition period.

corresponding to the midpoint of the corridor formed by the primary credit rate and the rate on excess reserves. To help compensate for the absence of any form of reserve requirements, which ordinarily help moderate volatility in interbank rates, the corridor between the primary credit rate and the rate on excess reserves would be relatively narrow compared to a framework in which some form of requirements were retained. This type of arrangement has been adopted by a number of central banks, primarily in countries where the number of depository institutions is relatively small or autonomous factors on the central bank balance sheet are less volatile compared to the U.S. case. A corridor width of 50 basis points is common (25 basis points on either side of the policy rate). For the United States, an appropriate band width would reflect a judgment about the trade-off between tolerable rate volatility and use of the standing facilities.

Using the analytical framework described in an accompanying memo, the daily demand for reserves in this framework would be expected to be relatively inelastic in a narrow range around a point established by daily reserve clearing demands. But, at least in theory, at quantities away from this point, demand quickly turns very elastic just inside the bounds set by the rates on the two standing facilities. Given the lack of requirements, there would be no regular daily pattern of reserve demand driven by period-averaging considerations. However, daily reserve clearing demands could follow a somewhat predictable pattern to the extent that payments flows are heavier on some days versus others.

- *Effectiveness of Monetary Policy Implementation*

The impact of this option on Desk operations and the Federal Reserve portfolio may be rather modest. The removal of requirements would lead to some reduction in the size of the domestic portfolio, which could be readily achieved. The overall composition of the portfolio could be much the same as at present.

The impact on open market operations and associated operating practices could depend on the tolerance for rate volatility within the corridor. In all likelihood, the need for daily fine-tuning operations would remain and possibly increase, as the removal of requirements would make rates within this corridor more sensitive to daily shifts in autonomous factors and clearing demands than at present.

Estimating the level of reserve clearing demands that would be associated with maintaining the interbank rate around its target on any day would present a new challenge. As shown in the top panel of exhibit 2, in principle the reserve demand curve in this option should have upper and lower bounds established by the primary credit rate and the remuneration rate on excess reserves, respectively. Between the upper and lower bounds, the demand for reserves would be determined by banks' daily demand for reserves for clearing purposes. The Desk has limited experience in making these estimates, and evidence suggests that daily minimum clearing needs can be volatile from day to day, influenced by such hard-to-anticipate factors as the level and degree of uncertainty of aggregate payment flows. Nonetheless, experience from other central banks operating within this type of framework suggests that somewhat predictable

patterns in this source of demand might quickly establish themselves. But even so, the current degree of uncertainty surrounding even same-day estimates of autonomous factors on the Federal Reserve's balance sheet is likely relatively large compared to ordinary daily clearing demands, even if these could be accurately estimated.

Within this framework, the federal funds rate and other very short-term rates would be expected to exhibit greater volatility, both from day to day and intra-day, at least if the Desk was limited to using current instruments. But this volatility would be confined within a narrower band around the target if the primary credit rate proved to be an effective cap on the rate. Whether such traditional measures of rate behavior as the daily effective rate or its intraday standard deviation would show more or less volatility than under the current regime would depend critically on the width of the corridor set by the standing facilities.

To some degree, a tendency for greater rate volatility perhaps could be addressed by the Desk being prepared to arrange operations late in the day to help address any net shortfall or surplus in its previous estimates of reserve supply or clearing demands. However, to be effective the Desk would need a better basis than it has today for judging the appropriate size of any reserve adjustment it might make later in the day to maintain the needed balance between reserve supply and demand.

One of the most important issues this framework would raise relates to its implications for the use of the standing facilities, particularly the primary credit facility. Usage of the primary credit facility, as measured by both frequency and size of drawings, would likely increase, even if continued "stigma" and other factors ensured that some market trading still occurred at rates above the primary credit rate. Such an outcome would in fact be an intended feature of this framework, designed to limit rate volatility. Under normal conditions, the risks to the Federal Reserve associated with more frequent primary credit borrowing arising from ordinary reserve fluctuations or mis-estimates are not likely significant. Situations where a financially unsound institution might have an incentive to borrow at the discount window rather than pay the high rates in the market could be controlled as at present, by distinguishing between banks eligible for primary or secondary credit.

- *Effectiveness of Policy Implementation in Times of Financial Stress*

With a narrow corridor, during times of financial market stress, DIs with excess liquidity might find it more attractive to hold on to remunerated excess positions well above their clearing needs, rather than to lend in the market to banks in need of funds. This, in turn, could result in significant increases in borrowing or, alternatively, require the Desk to add a sizable volume of reserves. Whether this framework provided a desirable or undesirable outcome in periods of stress might depend heavily on the specific circumstances. One positive feature of this framework is that when addressing episodes of financial stress by providing higher levels of excess reserves, any tendency for downward rate pressures to develop would be limited by having the rate on the deposit facility normally set closer to the policy target than under other options.

- *Distortions and Deadweight Losses*

One of the main advantages of this option would be its low administrative costs and regulatory burdens. Depository institutions would not have to provide any special information on deposits to calculate reserve requirements.¹⁸ The Federal Reserve would not have to maintain a complicated system for administering reserve requirements or clearing balance arrangements. With requirements eliminated and holdings of excess reserves compensated at rates perhaps not too far below the policy target, the reserve “tax” associated with holdings of reserves below market rates would be almost entirely eliminated.¹⁹

- *Efficiency and Resilience of Money Markets and Government Securities Markets*

Even with a relatively narrow corridor between the primary credit rate and the rate on excess reserves, the incentives for DIIs would be designed to be high enough to encourage them to transact in the market first before lending or borrowing with the Fed at the end of the day. In fact, with the removal of the buffer provided by maintenance period reserve averaging, incentives to actively manage daily reserve positions could even be somewhat higher. Thus, banks would likely utilize the money market much as they do now.

- *Efficiency and Resilience of the Payments System*

By reducing aggregate reserve levels through the elimination of reserve requirements and clearing balance arrangements, the incidence of daylight overdrafts under current PSR policies would almost certainly increase. Experience suggests that the typical demand for balances under this option would likely be at least moderately lower than the current levels of total requirements. Thus, while this option might be technically compatible with the proposed changes in PSR policies, it would tend to shift the demand for such credit higher. Depending on the specific PSR policies that might be adopted, structural re-arrangements among payments system participants might be needed to avoid potential congestion in settling transactions. Such changes could include expanded use of correspondent banking relations to allow more concentration and netting of total payment flows.

- *Transition and Other Issues*

In some respects, the transition to option 3 could be fairly straightforward. The Federal Reserve might begin by paying interest on required reserve balances and on excess reserves and the current system of contractual clearing balance requirements could be eliminated. As noted above, relatively small reductions in the reserve requirement ratio would likely result in the virtual elimination of required reserve balances. The

¹⁸ Again, sample-based reporting would be implemented to measure the money and credit aggregates.

¹⁹ Banks likely still devote some resources to minimizing their holdings of excess reserves, so some element of a “reserve tax” would remain.

Federal Reserve might wish to calibrate the reductions in the reserve requirement ratio to produce a fairly smooth decline in required reserve balances. For example, the marginal reserve requirement ratio could be reduced from 10 percent to 8 percent in, say, one-half percentage point increments over a period of a few months. That would allow the Desk and the banking system to gain experience in operating under a regime with very low levels of requirements. When the level of required reserve balances had been reduced to some minimal level, the reserve requirement ratio could simply be cut to zero to complete the transition. During the phase-out period, the Federal Reserve might wish to operate with a relatively narrow corridor to help stabilize the funds rate.

Option 4: Floor with High Balances

- *Summary and Important Policy Issues*

This option would reduce reserve requirements to zero and eliminate the current contractual clearing balance program. However, reserve balances would be remunerated at a rate only slightly below the target federal funds rate and the Desk would generally supply an ample volume of reserves. In principle, this system would facilitate tight control of the federal funds rate and could substantially simplify daily reserve management. Moreover, the structure of this option might be well suited to managing the unusual liquidity injections that may prove necessary during times of financial stress. One question that arises is the extent to which this option creates a highly desirable risk-free asset for individual banks or the system as a whole. For example, there may be perverse outcomes in which an individual institution might find Fed account balances to be a very attractive asset and choose to hold a very large quantity of balances rather than lend in the market. Banks might see Fed account balances as largely superior to holding Treasury bills and other very short-term assets, potentially creating upward pressure on Treasury yields. A particular risk arises when there is a sudden change in the financial climate that makes banks want to increase their hoarding of reserves, leaving other banks deficient despite a very large supply of reserves in the aggregate. This same risk does not exist under the current system or with some of the other options because the opportunity cost of holding excess reserves is relatively high in those systems. As noted in a variation on this basic option, these issues could likely be addressed by developing a system of account balance caps. Finally, option 4 raises some governance issues. By statute, the Board is responsible for establishing rates to be paid on balances. However, under option 4, the rate established by the Board for interest on balances would be intimately connected with the FOMC's target federal funds rate.

- *Key Structural Elements*

Option 4 resembles option 3 in some of its basic components—zero reserve requirements and the elimination of contractual balance requirements, coupled with a corridor system with the upper bound determined by the primary credit rate and a lower bound established by the remuneration rate on reserve balances. The key distinguishing characteristic of the basic high balance variant of option 4 is that the lower bound of the corridor would be established at a rate just below the FOMC's target federal funds rate

and the Desk would supply reserves each day so that federal funds would trade just above the lower bound of the corridor. As a concrete example, the remuneration rate on reserve balances might be set at, say, 10 basis points below the target federal funds rate. With no reserve requirements or clearing balance requirements, the Desk would focus on supplying a quantity of reserves each day large enough to ensure that federal funds would trade very close (just above) the remuneration rate on reserve balances—that is, close to the target federal funds rate.

In the high balance with caps variant of option 4, some limitations would be imposed on the quantity of reserve balances that would be eligible for remuneration at close to the target rate. This limit would be established to avoid scenarios in which an individual bank might find reserve balances to be a very attractive investment option and, as a result, choose to hold outsized quantities of reserve balances. A simple approach to establishing limits along these lines might be to administratively set an upper bound based on a percentage of an institution's total domestic assets as reported on the most recent call report. For example, an upper bound for any depository institution might be set at, say, 1 percent of total domestic assets. Any balances held up to this amount would be remunerated at a rate just below the target federal funds rate. Balances above this level would be remunerated at a rate substantially below the target federal funds rate. Alternatively, it might be possible to allow banks to choose their own caps by employing a fee mechanism. For example, banks might be charged, say, a 10 basis point fee (annual rate) on the cap amounts they choose. The Federal Reserve could adjust the cap fee over time to influence the aggregate level of caps that banks establish.

- *Effectiveness of Monetary Policy Implementation*

Both variants of option 4 would have major implications for the Desk's reserve management. In general, by eliminating required reserves, reserve maintenance periods and the associated averaging and carry-over provisions, and by reducing to zero the opportunity cost of holding reserves, these options could simplify many aspects of the Desk's current procedures in implementing monetary policy. As discussed in the accompanying analytical framework memo, and as illustrated in the middle panel of exhibit 2, the demand for reserves in the basic high balance option would become essentially flat beyond some critical level, which should allow the Desk to maintain the federal funds rate very close to the target rate. Notably, this tight control of the funds rate could be achieved, in principle, without the need to target a precise quantity of reserves on a day to day basis. The Desk could operate by supplying an ample quantity of reserves that would tend to diminish the need for daily operations to fine-tune the level of reserves on a daily basis. In this case, the Desk might be able to manage reserves effectively with relatively infrequent term repo operations. Moreover, the Desk might not need to take actions to respond to idiosyncratic and seasonal factors that temporarily *add* reserves; these supply factors could simply be allowed to show through to higher levels of reserve balances while still maintaining the federal funds rate close to the target rate.

As in the basic high balance option, the reserve demand curve for the high balances with caps variation would become flat beyond a critical level. At a point close to the cap, the demand curve should tend to move lower and begin to asymptote to the lower remuneration rate on balances above the cap levels. As shown in exhibit 2, standard models suggest that the demand curve should begin to move lower before the point at which the caps become binding. At some point before the caps become binding, a depository will recognize that it may be hit with an unexpected inflow of reserves that would could push its reserve balance above the full-remuneration cap. At this point, the depository may be willing to sell funds in the market at a rate below the target federal funds rate in order to avoid this outcome. However, if the caps are fairly generous and not binding in ordinary circumstances, the same basic Desk implementation strategy noted above would seem to be appropriate in the variation with caps.

- *Caveats*

As noted above, both versions of option 4 should result in a flat reserve demand curve over a wide range beyond a certain level. If this proved to be the case in practice, it seems likely that the Federal Reserve would be able to maintain the federal funds rate very close to the target in this scenario by simply supplying an ample quantity of reserves each day.

There are, however, some caveats that should be noted in this regard. Standard reserve management models imply that banks should be content to hold any quantity of reserve balances as long as the balances are remunerated at close to the target federal funds rate. However, banks' asset management choices may well be more nuanced than this in practice. In some cases, depositories might be expected to have target allocations across different asset classes with different credit and interest rate risk characteristics. Forcing the banking system to hold a large volume of a particular risk-free asset (central bank reserves) could result in some institutions holding a larger allocation of reserves than desired based on portfolio management considerations. How this might affect bank behavior and trading patterns in the federal funds market is difficult to predict.

Finally, there may be cases in which the distribution of reserves could become important. For example, the Reserve Bank of New Zealand discovered that one of its depositories wished to hold much larger daily levels of reserve balances than had been anticipated, effectively leaving the remainder of the banking system short reserves and thus contributing to upward pressures on interbank rates on some days. In principle, this sort of distributional effect could be offset through open market operations if it were predictable. Still, this type of experience suggests that maintaining the funds rate at the target under this option may be more complicated in practice than is suggested by the simple diagram in Exhibit 2.

- *Distortions and Deadweight Losses*

The opportunity cost of holding reserves under the high balance options would be zero with reserves remunerated at the target rate, so the traditional notion of the "reserve tax"

would be eliminated. Moreover, by eliminating reserve requirements, this option would result in substantial reductions in reporting and regulatory burdens for depository institutions. Depository institutions would not need to provide detailed deposit information for the calculation of reserve requirements and the Federal Reserve would not need to devote the current level of resources to processing this information. In addition, depositories and the Federal Reserve would not need to devote resources to all the particular features of the current system of monetary policy implementation including penalties for reserve deficiencies, as-of adjustments, tranche loss adjustments, enforcement of regulation D restrictions and so on. Under the high balance option with caps, some administrative burdens for banks and the Federal Reserve would remain in determining and tracking cap levels. Moreover, the automation for the high balance option with caps would be complicated by the need to monitor balances against cap levels to determine the appropriate interest payments. As in options 2 and 3, the Federal Reserve could collect deposit information necessary to create the monetary aggregates based on sampling techniques.

- *Efficiency and Resilience of the U.S. Money Markets and Government Securities Markets.*

A significant question mark in evaluating potential implications of option 4 for payment is related to the possible impact of these options on the efficiency of interbank markets. The usual incentives for banks to trade reserves—the desire to avoid penalties for reserve deficiencies and overnight overdrafts and the opportunity costs associated with holding non-interest bearing excess reserves—would be much attenuated. As noted above, the marginal incentives for banks to trade reserves might be based on the potential costs associated with uncollateralized daylight credit, which seem likely to be rather small. With little trading activity and the funds rate mostly pegged very close to the target, the role for federal funds brokers could be considerably diminished. This possible degradation in the efficiency of the funds market could also have some corresponding impact on the efficiency of the payment system.

Other market effects are harder to judge and would depend partly on how the Desk chooses to operate. On net, the banking system would likely end up holding a larger volume of reserves under this option than at present matched by a corresponding reduction in the public's holding of Treasury securities. In principle, these relative supply effects might be large enough to put some noticeable downward pressure on Treasury yields. On the other hand, by providing a new risk-free asset with a market-based rate, the Federal Reserve might trigger market reactions that could put upward pressure on some short-term yields. For example, it seems possible that, for banks at least, reserves remunerated at close to the target funds rate would dominate Treasury bills as an asset class—interest-bearing reserves would be an essentially risk-free asset, the target funds rate would likely be above the rate on Treasury bills due to risk and liquidity premiums, and reserves would have ancillary benefits beyond their pecuniary return in terms of meeting banks' payments needs. If interest-bearing reserves turned out to be a dominant asset class, banks might wish to sharply reduce their holdings of Treasury bills, thus putting upward pressure on Treasury yields. Of course, in supplying additional

reserves to meet such increased demands, the Federal Reserve would be purchasing additional Treasury securities which should tend to damp the upward pressure on Treasury bill yields.

- *Efficiency and Resilience of the Payment System*

Both versions of option 4 could have significant implications for the payment system. Large end-of-day balances should reduce daylight overdrafts to the degree that overnight balances are held by depositories that currently rely heavily on intraday credit to meet their payments needs. Providing ample overnight reserve balances remunerated at a market rate might then be viewed as offering depository institutions another means by which they can meet their intraday needs for reserve balances. The Board has recently proposed for public comment a change in payment system risk policies that would involve providing collateralized daylight overdrafts at a zero fee and uncollateralized overdrafts at a penalty fee. Both variants of option 4 could be viewed as complementary to this overall approach. The increased quantity of end-of-day reserve balances would, like collateralized daylight credit, reduce the risk to the Federal Reserve in providing real-time settlement over Fedwire. Moreover, it would provide an additional degree of flexibility for depository institutions in managing their intraday needs for reserves. For example, some institutions may find it difficult or expensive to post a large volume of collateral to secure daylight overdrafts. Alternatively, they might find it relatively difficult to keep daylight overdrafts below their caps. These institutions then could hold larger end-of-day reserve balances, remunerated at the target funds rate, to help meet their intraday needs for reserve balances without needing to rely upon high-cost uncollateralized daylight credit or risk breaching their caps. Over time, it might be possible to raise the fee for uncollateralized daylight credit or even prohibit uncollateralized daylight credit altogether if depositories are able to hold large end-of-day balances as a ready alternative with little or no opportunity cost. The potential to draw on large end-of-day reserve balances for payments needs might also help to mitigate incentives for banks to queue payments in an effort to avoid cap breaches or reliance on high-cost uncollateralized daylight credit.

As in options 2 and 3, option 4 would also involve the elimination of the current system of contractual clearing balances. As noted above, these balance currently figure prominently in the pro forma balance sheet used by the Federal Reserve in establishing fees for priced services. Option 4 would, like many of the other options, also provide greater incentives for depositories to economize on vault cash. The extent of substitution between currency holdings and interest-earning reserve balances would be limited by the need to maintain currency on hand to meet customer needs. Nonetheless, one might expect a number of depositories to pare their vault cash holdings and investigate options like custodial currency arrangements that might allow for more “just in time” availability of currency.

- *Transition and Other Issues*

As noted above, there are significant uncertainties about how option 4 would work in practice. In light of these uncertainties, it seems desirable to consider a fairly lengthy transition under this option. This could be accomplished by initially paying interest on RRB and on excess reserves under the current system at a rate just below the target federal funds rate. The Desk could then gradually increase the level of excess reserves to quite high levels. For example, the Desk might ramp up the level of excess reserves from something close to \$2 billion to, say, \$20 billion over a period of several months. At the end of this period, the level of requirements would presumably not be a large factor influencing day-to-day reserve demands for most institutions, so that the Desk could experiment with some of the possible changes in approach to reserve management discussed above under the heading of the effectiveness of monetary policy implementation. Once the banking system and the Desk seemed to adjust to new operating procedures, the Board could reduce reserve requirements to zero to complete the transition to the new system.

Both versions of option 4 would pose some governance issues for the Federal Reserve System. As noted above, the remuneration rate on reserves in these options would be the fundamental factor determining the effective federal funds rate each day. The statute indicates that the Board has the authority to set the remuneration rates on all balances. However, the Federal Open Market Committee would also have a keen interest in the remuneration rate on reserves. In many respects, the coordination between the FOMC and the Board could be fairly straightforward, but it would require an explicit or tacit agreement between the FOMC and the Board. The FOMC could set the target federal funds rate following its current procedures. Following each FOMC meeting, the Board could then separately establish a remuneration rate for reserves set just below the target rate in conjunction with its consideration of the discount rate. Alternatively, the Board might simply establish a formula for the remuneration rate based on the FOMC target rate.

Option 5: Wide Daily Band

- *Summary and Important Policy Issues*

A number of monetary policy frameworks that have been proposed, and in some cases adopted by central banks, discard the multi-day maintenance period feature entirely. They differ from one another, however, in the degree or way in which they compensate for the effects of the resulting loss of “reserve averaging” in a multi-day maintenance period on the shape of daily reserve demand curves and associated behavior of the overnight interbank rate. Under option 5, the elimination of a multi-day maintenance period and reserve averaging is offset by having a relatively wide clearing band around a level of voluntary daily balance targets. In most other respects, however, the framework for option 5 closely resembles, and raises many of the same policy issues, as option 2, including (i) the replacement of mandatory reserve requirements and contractual clearing balance requirements with a system of voluntary daily balance targets, (ii) the remuneration of excess reserves at a rate appreciably below the target federal funds rate, (iii) implications for the level of daily requirements (in combination with the width of the clearing band) on the implementation of monetary policy and incidence of intraday credit exposures of the Federal Reserve, and (iv) implications for the pro-forma balance sheet utilized in pricing Federal Reserve services.

- *Key Structural Elements*

In the (voluntary) daily reserve balance target option, reserve requirements would be reduced to zero and the current system of contractual clearing balances with implicit interest in the form of earnings credits would be eliminated. There are many possible methods by which the level of each bank’s notional daily balance target might be set, starting with simply letting each bank choose its own level without restriction. But if such an approach were thought likely to yield an aggregate level or distribution of daily targets that would be problematic, then other methods might be adopted that feature incentives, costs, or minimum or maximum limits. For example, a minimum daily target might be based on some fraction of a bank’s total assets. Similarly, rules would need to be established for determining the period of time for which daily balance targets would be set and the frequency with which changes could be made to voluntary reserve targets. These important considerations are similar to those that would be faced under option 2.

A key feature of this regime is the size of the daily clearing band centered around the level of the daily balance target. For expository purposes, we will choose a clearing band level of 50 percent of the voluntary balance target as representative of a “wide” clearing band but one that still leaves limits that banks and the Desk would need to be mindful of in their management of reserves.

All balances held up to the high end of the clearing band would be remunerated at a rate close to the target federal funds rate. Balances in excess of the upper end of the clearing band would be remunerated at a lower rate set at, say, 1 percentage point below the target federal funds rate. If a bank held a balance that was below the low end of its clearing

band but above zero, it would be remunerated on those balances but would also pay a penalty of, say, 1 percentage point applied to the shortfall of actual balance relative to the low end of the clearing band. Only if balances fell below zero would a bank have to cover this deficiency by borrowing at the discount window (or by paying a higher overdraft fee).

- *Effectiveness of Monetary Policy Implementation*

The daily reserve demand curve in this option might look like that depicted in the bottom panel of exhibit 2. The width of the flat portion of the demand curve would depend on the width of the clearing band around the daily target balance level. The penalty fee associated with holding a level of balances below the lower bound of the clearing band (and the primary credit rate for balances below zero) and rate of remuneration on excess reserves would establish an upper and lower bound for the demand curve. Each day's demand curve might look very similar to one another, possibly excepting days when there is high payment flow uncertainty. Moreover, the shape of the demand curve near either end of the clearing band would not be affected by reserve considerations for the next day nor depend on outcomes from the preceding day. And under ordinary circumstances, a level of reserves around the midpoint of the clearing band might be expected to be consistent with the operating objective.

In supplying reserves, the Desk would likely operate in a manner similar to that under current arrangements. While each bank would have its own well-defined clearing band, in practice the Desk would need to develop a sense of how rates would behave with different aggregate levels of reserves—measured relative to the level of aggregate target balances. The frequency of Desk intervention or need for fine-tuning would depend on the width of this conceptual aggregate clearing band, the degree of volatility in autonomous factors, and other factors that could shift banks' preferred holdings of reserves relative to their target. These considerations argue for engineering a relatively high level of target balances with a wide clearing band.

The daily target balance program could provide some flexibility during periods of financial distress. As under option 2, at times when the Federal Reserve wishes to provide more Federal Reserve credit or otherwise expand the level of aggregate reserves it could temporarily raise the rate of remuneration on excess reserves to a level closer to the remuneration rate on balances below the upper bound of the band as way of both stabilizing the funds rate and avoiding situations in which some institutions are left holding very costly large excess reserve positions.

Alternatively, the Fed might simply expand the width of the clearing band above the level of daily target balances, in theory by any amount (for example, even well above 100 percent of requirements). Doing so should not directly disadvantage any banks, although it could indirectly disadvantage banks that routinely rely on borrowing in the overnight sector if banks with excess positions simply chose to hold balances that they would otherwise have lent. Thus, an expansion of the clearing band on the upside should only be undertaken in conjunction with a corresponding provision of additional reserves. Still,

there could be situations where some banks have greater difficulty securing enough funding in overnight markets to reach the lower end of their clearing band if banks hoard reserves. This risk could be addressed by expanding the clearing band on the down side as well, or by reducing or eliminating the penalty associated with holding a level of balances below the lower end of a bank's clearing band, either independently or in conjunction with a reduction in the primary credit facility rate for banks that end in overdraft.

- *Distortions and Deadweight Losses*

A voluntary system of daily target balances would eliminate the reserve tax and reduce reporting and administrative burdens relative to the current system in much the same manner as option 2. As with option 2, however, a system of voluntary daily target balances with a clearing band would introduce some new administrative elements.

- *Efficiency and Resilience of Money Markets and Government Securities Markets*

The net effect on money and securities markets of a daily target balance program is most likely to depend on the width of the clearing band, and the risks that payment flows and other uncertainties will place a bank's reserve holdings outside this band. A very wide band could lead to a less active interbank market. However, unlike option 4, it would not necessarily be a design objective of option 5 to have clearing bands so wide as to eliminate these risks from banks' reserve management considerations. Likewise, a high level of target balances could have some impact on banks' balance sheet structure and a corresponding increase in the size of the Fed's domestic portfolio, but a level of target balances liable to induce significant balance sheet restructuring or have effects on markets for assets held in the Fed's portfolio seems unlikely.

- *Efficiency and Resilience of the Payments System*

The daily target balance program would have the same implications for Federal Reserve priced services as would option 2. The implications of option 5 for usage of intraday credit, either under current policies or under two-tier pricing, would likely depend on the overall level of target balances. As with option 2, depository institutions that perceive significant costs in pledging sufficient collateral to cover their need for intraday credit could find it attractive to establish a comparatively large voluntary balance target. In effect, the Federal Reserve would allow depositories to decide how much of their intraday credit needs they wish to meet by relying on higher end-of-day balances versus relying on collateralized daylight overdraft credit.

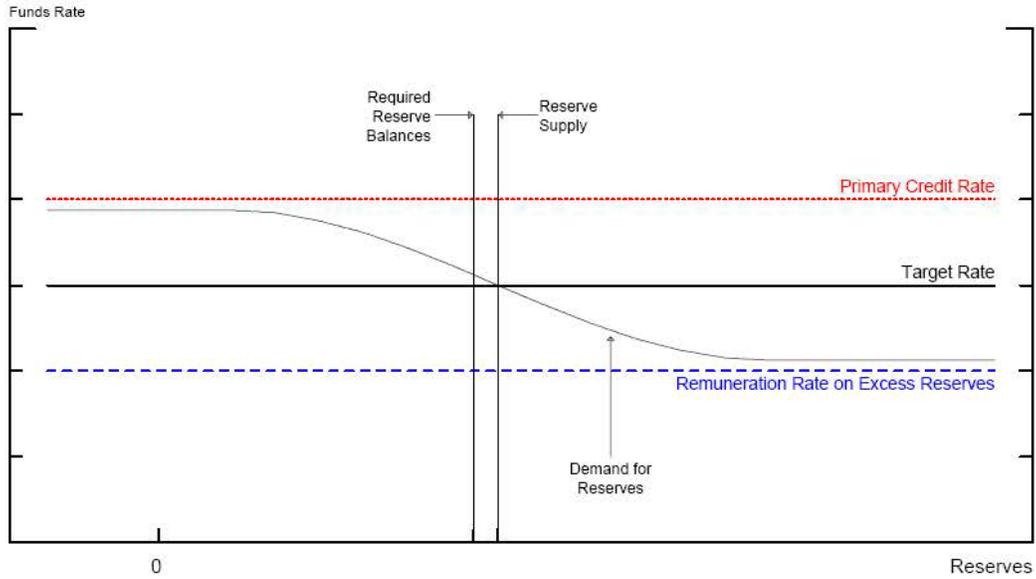
- *Transition Issues*

The transition to a system of voluntary daily balance targets would involve a number of steps that would need to be carefully managed. The move to a one-day maintenance period concept would involve substantial changes to existing automation systems. Moreover, the elimination of the existing contractual clearing balance program and the

transition to the new system would require a very significant outreach effort on the part of Reserve Banks to depository institutions in their respective districts. A gradual transition to zero reserve requirements under this option might be difficult but might follow a process like that outlined for option 2. The existing contractual clearing balance program could be maintained with explicit interest during a transition period in which required reserves are reduced to zero. At the end of the transition period, contractual clearing balance arrangements would be eliminated and banks would establish daily voluntary balance targets. And as with most options, the Federal Reserve would need to restructure its report collection for the purposes of constructing the monetary aggregates.

Exhibit 1
Period-Average Frameworks

Option 1: Remunerate Required and Excess Reserve Balances



Option 2: Voluntary Balance Targets

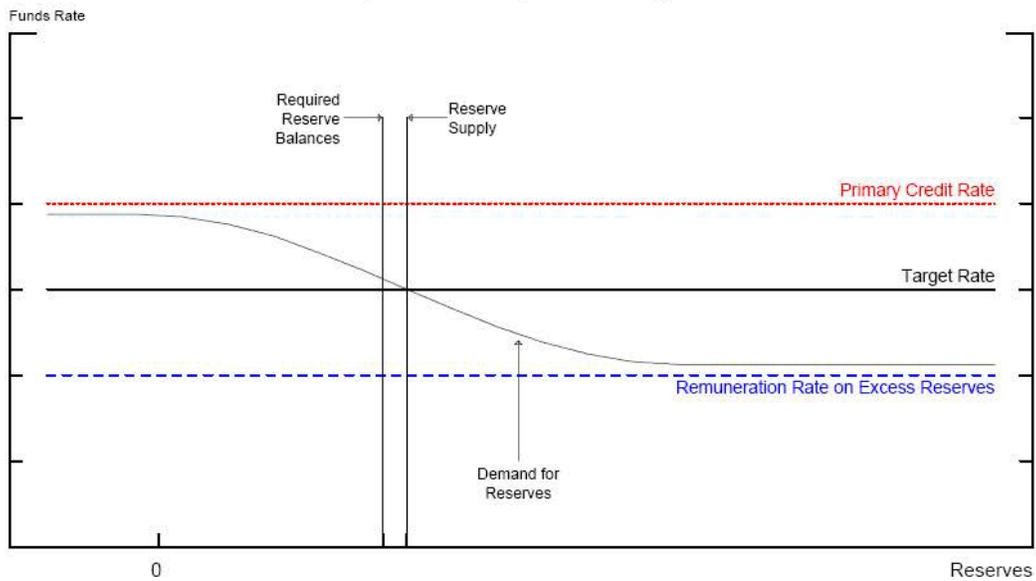
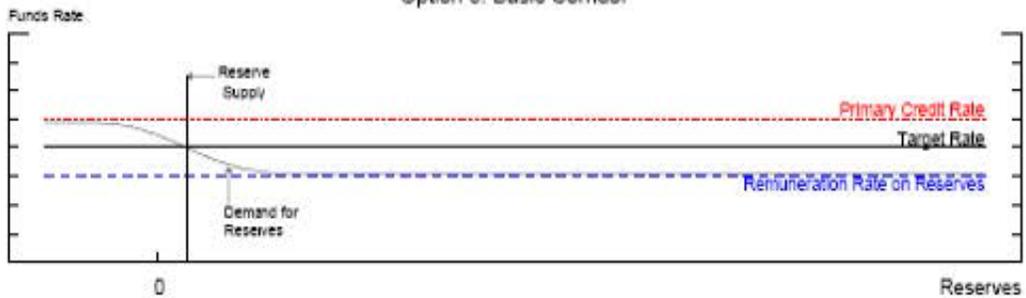
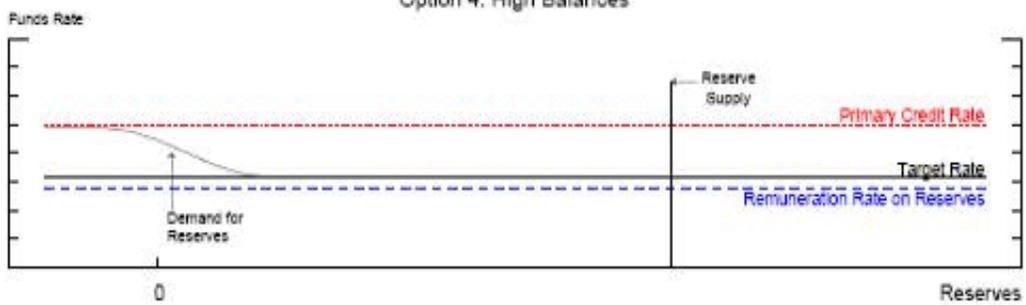


Exhibit 2 Daily Frameworks

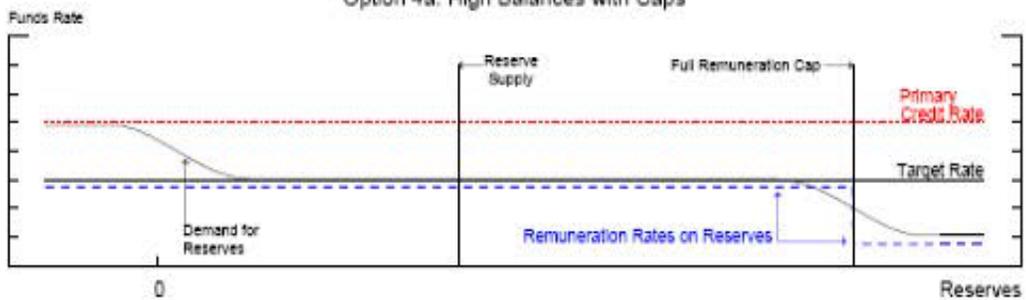
Option 3: Basic Corridor



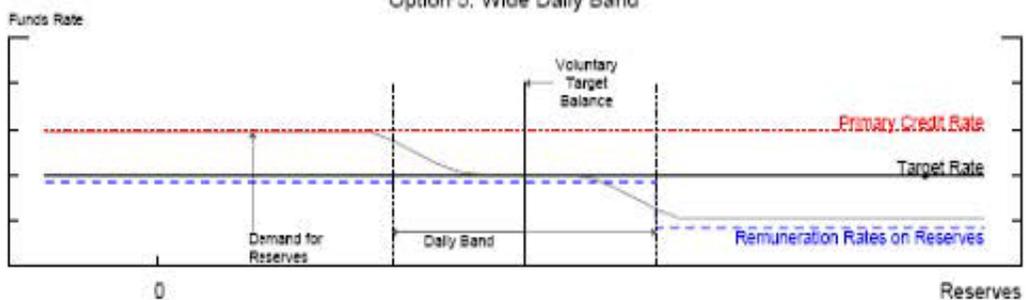
Option 4: High Balances



Option 4a: High Balances with Caps



Option 5: Wide Daily Band



V. General Issues

The discussion above raises some general issues that cut across a number of the options under consideration. A few of the general issues are noted below including restructuring reserve requirements, potential changes in approach to open market operations, some governance questions, implications for Federal Reserve priced services, implications for correspondent banking and the potential role for reserves as an important risk-free asset.

Restructuring Reserve Requirements: As noted above, the current system of reserve requirements is very burdensome for both depository institutions and the Federal Reserve. Moreover, it was designed with the intent of controlling a narrow measure of the money stock. If policymakers were to determine that mandatory requirements remain a useful device for monetary policy implementation in the United States, it might be desirable to pursue legislation that would allow the Federal Reserve to apply reserve requirements against a very broad base such as total liabilities of depository institutions. This would have the advantage of greatly reducing the marginal reserve requirement necessary to generate any given level of required reserves. In addition, it would eliminate incentives under the current system for banks to minimize particular types of deposits. A system such as this could be specified so that only reserve balances (not vault cash) could be used to satisfy the requirement, thus ensuring that all institutions would be “bound” by reserve requirements to some degree. Notably, two other major central banks—the ECB and the Bank of Japan—continue to employ reserve requirements, but apply them to a broad base of liabilities with a low required reserve ratio. These banks have experienced little reserve-avoidance activity.

Reserve Supply: Much of the discussion of options above abstracts from possible changes in the conduct of open market operations. For example, under any of the options considered, it might be possible for the Desk to stabilize the funds rate over the course of the day by conducting operations at frequent intervals in response to intraday developments in the federal funds market.

Governance: The language of the legislation indicates that the Board would determine remuneration rates on balances that depository institutions hold at the Reserve Banks. The language of the Act suggests that the Board could set the same or different remuneration rates on required reserve balances and excess reserve balances. Specifically, the legislation delegates authority to the Board to prescribe regulations regarding the payment of interest on reserves.

The Board could set remuneration rates by a formal Board vote following policy actions of the FOMC, in conjunction with discount rate actions. The Board may wish to establish a contingency procedure for setting the remuneration rates on deposits in the event that a quorum of the Board is not available.

Alternatively, the Board could issue a regulation that would prescribe a formula that would determine remuneration rates. In this case, the Board would not need a formal vote to approve every change in remuneration rates. The Board may wish to establish a

contingency procedure for modifying the formula in the event that a quorum of the Board is not available.

Implications for Priced Services: Many of the options considered above could have implications for the pricing of Federal Reserve financial services. Currently, fees for Fed services reflect imputed earnings on assets in a pro-forma balance sheet and imputed interest expense on liabilities in that balance sheet, along with the direct costs incurred by the financial services operations. The largest source of funding in this pro-forma balance sheet comes from required clearing balances; at present, required clearing balances pay implicit interest at a rate equal to 80 percent of the three-month Treasury bill rate. This “low cost” funding source on the pro-forma balance sheet effectively lowers the fees for various Federal Reserve services that are necessary to fully recover costs. Any change in monetary policy implementation that eliminates or substantially reduces the level of required clearing balances would likely reduce cost recovery for the Federal Reserve in the provision of priced services.

Implications for Correspondent Banking: Under most of the options described above, the Federal Reserve might be viewed as essentially structuring a new type of deposit account. Options in which banks can hold significant quantities of reserves that are remunerated at close to the target federal funds rate may raise questions among correspondent banks about a “level playing field.” In particular, banks will not be able to pay interest on demand deposits, so it may appear that the Federal Reserve is utilizing its new authority in a way that is detrimental to the business prospects of correspondent banks. It is difficult to gauge in advance how significant this problem might be, but it may be worthwhile for the Federal Reserve to continue to pursue legislative changes that would allow banks to pay interest on demand deposits by 2011.

Reserves as a Risk Free Asset: The risk-free asset plays a central role in many models of asset pricing. As noted above, some of the options would create a new risk-free asset available to depository institutions—interest-bearing reserves held at the Federal Reserve. Moreover, the pricing of this risk-free asset, by construction, may be somewhat different than that observed for Treasury securities. At present, for example, when there are strong safe-haven demands, Treasury yields and even general-collateral repo rates drop sharply. By contrast, under most of the options described, the yield on Fed account balances would be determined largely by the FOMC’s target rate. It is again difficult to gauge in advance whether this would prove to be important or not. However, it seems possible that depository institutions might find interest-bearing reserves to be the relevant risk-free asset to use in structuring the composition of their assets. If so, some of the options could generate elevated demands for reserves while safe haven demands for Treasuries could be reduced.

Appendix A: Legislative Language

TITLE II—MONETARY POLICY PROVISIONS

SEC. 201. AUTHORIZATION FOR THE FEDERAL RESERVE TO PAY INTEREST ON RESERVES.

(a) IN GENERAL.—Section 19(b) of the Federal Reserve Act (12 U.S.C. 461(b)) is amended by adding at the end the following:

“(12) EARNINGS ON BALANCES.—

“(A) IN GENERAL.—Balances maintained at a Federal Reserve bank by or on behalf of a depository institution may receive earnings to be paid by the Federal Reserve bank at least once each calendar quarter, at a rate or rates not to exceed the general level of short-term interest rates.

“(B) REGULATIONS RELATING TO PAYMENTS AND DISTRIBUTIONS.—The Board may prescribe regulations concerning—

“(i) the payment of earnings in accordance with this paragraph;

“(ii) the distribution of such earnings to the depository institutions which maintain balances at such banks, or on whose behalf such balances are maintained; and

“(iii) the responsibilities of depository institutions, Federal Home Loan Banks, and the National Credit Union Administration Central Liquidity Facility with respect to the crediting and distribution of earnings attributable to balances maintained, in accordance with subsection (c)(1)(A), in a Federal Reserve bank by any such entity on behalf of depository institutions.

“(C) DEPOSITORY INSTITUTIONS DEFINED.—For purposes of this paragraph, the term ‘depository institution’, in addition to the institutions described in paragraph (1)(A), includes any trust company, corporation organized under section 25A or having an agreement with the Board under section 25, or any branch or agency of a foreign bank (as defined in section 1(b) of the International Banking Act of 1978).”.

(b) CONFORMING AMENDMENT.—Section 19 of the Federal Reserve Act (12 U.S.C. 461) is amended—

(1) in subsection (b)(4)—

(A) by striking subparagraph (C); and

(B) by redesignating subparagraphs (D) and (E) as subparagraphs (C) and (D), respectively; and

(2) in subsection (c)(1)(A), by striking “subsection (b)(4)(C)” and inserting “subsection (b)”.

SEC. 202. INCREASED FLEXIBILITY FOR THE FEDERAL RESERVE BOARD TO ESTABLISH RESERVE REQUIREMENTS.

Section 19(b)(2)(A) of the Federal Reserve Act (12 U.S.C. 461(b)(2)(A)) is amended—

(1) in clause (i), by striking “the ratio of 3 per centum” and inserting “a ratio of not greater than 3 percent (and which may be zero)”; and

(2) in clause (ii), by striking “and not less than 8 per centum,” and inserting “(and which may be zero),”.

SEC. 203. EFFECTIVE DATE.

12 USC 461 note.

The amendments made by this title shall take effect October 1, 2011.

Appendix B: Other Possible Changes to the Framework for Implementing Monetary Policy

The focus of the Interest on Reserves Workgroup has been on those elements of the operational framework for implementing monetary policy that will be most directly affected by the new authority to pay explicit interest on Federal Reserve balances (“reserves”) held by depository institutions. However, there are other changes to the operating framework that could also improve its overall effectiveness, and which are not dependent on authority to pay interest on reserves. Some of these possibilities would require legislative amendments to the Federal Reserve Act, while others the Federal Reserve already has authority to implement. A number of specific modifications to the operating framework, particularly ones that might be useful during periods of market stress, have come under review in the aftermath of the strains in the interbank market that emerged in August 2007.

In this appendix we describe in very general terms some possible changes in the operating framework that have been considered, and which are not dependent on authority to pay interest on reserves. Our purpose is to identify particular synergies that might exist between these possible changes and the various options for an operating framework that we present in this study. Our list is not exhaustive, and it is not intended to advocate any particular changes to the operating framework either by inclusion or exclusion. Rather, it is intended to stimulate further thought about the totality of modifications to the framework for implementing monetary policy, including those that depend on authority to pay interest on reserves, which might be pursued simultaneously.

1. Several proposals contemplate an expansion either of the types of counterparties to whom the Federal Reserve extends credit or of the types of collateral that it accepts against extensions of credit on discretionary operations.

These changes might be applied either to open market operations, or to discount window activities (e.g., through a mechanism such as the Term Auction Facility). Changes of this sort to Federal Reserve discretionary operations and to the domestic portfolio would very likely be equally effective with any of the options for the operating framework reviewed in this study. However, it might be particularly important to supplement Option 4 (Floor with High Balances) with the capability to conduct discretionary operations with expanded counterparties and collateral. A major source of uncertainty we have identified with Option 4 is the possible impact on the functioning of the interbank market for distributing reserves, which could result from the increased substitutability between holding (excess) reserves and lending in the interbank market over a broad range of aggregate reserve levels. These effects might be particularly pronounced during periods of market stress. For this reason, the Federal Reserve may wish to have expanded flexibility for directing the flow of its credit through discretionary operations, which expanded counterparties and collateral might provide.

2. Several proposals contemplate expanding the operational ability of the Federal Reserve to drain large amounts of liquidity (reserves), on relatively short notice and in concentrated periods of time.

This increased capability might be achieved in any of several different ways—holding higher levels of short-term bills in the portfolio, increasing the level of short-term RPs outstanding in the portfolio which could then be run off if needed, enhancing the operational capacity to arrange term reverse RPs or outright sales, or borrowing in the federal funds market or issuing central bank debt to absorb liquidity. The objective of large scale reserve absorbing operations of this sort in all likelihood would not be to achieve a lower level of reserves at the end of the day, but rather to offset movements in other balance sheet components that would otherwise leave much too high a level of reserves, whether arising from movements in autonomous factors, discretionary operations, or generated through standing facilities.

An enhanced capability to absorb reserve surpluses on a large scale within a short period of time would be very desirable under most of the options for an operating framework that we reviewed. However, this capability might be less critical for Option 4 (Floor with High Balances), because the consequences of a surplus level of reserves are likely to be much less severe so long as reserve levels remain below any caps that might be in place. While some of the other options might also allow for a greater capacity to avoid adverse consequences of temporarily high levels of excess balances than we have at present, the ability to insulate rate movements from reserve shocks (in either direction) is a distinguishing feature of Option 4.

3. Proposals have been made for the Desk to arrange discretionary operations more frequently throughout the day, or simply later in the day, in order to better control Federal funds rate movements around the operating objective.

The information about reserve levels that would be available to the Desk upon which to base such operations would be the same under all the options for an operating framework considered. However, a need for more frequent operations to control intraday rate movements could be somewhat greater with Option 3 (Basic Corridor), if a higher degree of rate volatility within a narrower corridor arising from mis-estimates of reserve supply or demand was thought to be a problem. Conversely, more frequent operations might be of much less value under Option 4, as transient reserve shocks, even large ones, would likely have relatively little impact on rate movements under that framework.

4. Several recommendations have been made to increase the transparency of open market operations and related operating objectives through greater communication, possibly via daily publication of reserve forecasts and related information.

Information about daily reserve levels would help market participants better judge the Desk's daily reserve objectives under all the options, thereby improving market function by facilitating formation of expectations. However, such information might be of relatively little benefit in the case of Option 4, as the overnight interbank rate is likely to

be less sensitive to daily levels of reserve balances. Information regarding the structure of the portfolio and the need for operations would still be of value to market participants even with this option.